



LSRCP CHINOOK SALMON HATCHERY EVALUATIONS—IDAHO

1994 Annual Report

Report Period October 1, 1993 to September 30, 1994



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To

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ABSTRACT

This annual report summarizes Idaho-Lower Snake River Compensation Plan (LSRCP) Hatchery Evaluation Studies from October 1, 1993 through September 30, 1994. Included in this report are all 1994 adult chinook salmon *Oncorhynchus tshawytscha* returns and all releases of juvenile spring and summer chinook salmon made within the reporting period. The releases mainly included fish that emigrated in 1994, but also include some fish that emigrated in spring 1995. Information presented in this report supercedes that included in previous reports.

Adult returns of spring and summer chinook salmon to the upper Snake River drainage in 1994 were the lowest on record. Lower Granite Dam counts included 3,120 spring chinook salmon and 795 summer chinook salmon, of which 46 and 81, respectively, were jacks. The 1994 dam counts, which included an estimated 1,416 and 305 wild spring and summer chinook salmon, respectively, were 15% and 10% of the respective 1993 counts. Adult returns to Idaho hatchery racks included 854 and 563 spring and summer chinook salmon, respectively. These returns were 10% of the spring and 20% of the summer chinook salmon 1993 hatchery rack returns.

Returns to Lower Snake River Compensation Plan chinook salmon hatcheries in Idaho totaled 328 spring and 527 summer chinook salmon. These numbers represent 13% (spring run) and 19% (summer run) of the 1993 returns. Adult returns remain well below the Idaho-LSRCP program mitigation goals of 40,560 adult spring and 8,000 adult summer chinook salmon.

Adult spring chinook salmon returns in 1994 to specific Idaho-LSRCP trapping locations were: upper Salmon River (Sawtooth Fish Hatchery), 96; East Fork Salmon River, 15; Red River satellite, 31; Crooked River satellite, 26; Powell satellite, 86; and North Fork Clearwater River (Dworshak National Fish Hatchery), 74. A total of 527 summer chinook returned to the South Fork Salmon River trap, the collection site for McCall Fish Hatchery.

Chinook salmon returns to non-LSRCP Idaho hatcheries included 526 spring chinook (Kooskia National Fish Hatchery, 232; Rapid River Fish Hatchery, 265; Oxbow Fish Hatchery, 29) and 61 summer chinook salmon (Rapid River Fish Hatchery, 25; Pahsimeroi Fish Hatchery, 36). These numbers may include a small number of naturally-produced fish.

Smolt-to-adult return rates for marked (coded-wire-tagged, fin clipped or internally marked) brood year 1989 Idaho-LSRCP chinook salmon ranged from 0.006% for Sawtooth Fish Hatchery coded-wire-tagged spring chinook salmon to 0.19% for coded-wire-tagged or Oxytetracycline-marked McCall Fish Hatchery summer chinook salmon. Coded-wire-tagged presmolts from the Clearwater Anadromous Fish Hatchery satellite facilities (Red River, Crooked River, and Powell) returned at rates of 0.010%, 0.002%, and 0.011%, respectively.

Idaho's LSRCP hatcheries operated by Idaho Department of Fish and Game released 1,060,163 summer chinook salmon smolts, 777,771 spring chinook salmon smolts, and 22,246 spring chinook salmon presmolts for the 1994 emigration. These juveniles were the progeny of brood year 1992 adults. Also, 1,448,239 brood year 1993 spring and summer chinook salmon parr and presmolts were released for the spring 1995 emigration.

Detection rates at Lower Snake River dams for PIT-tagged Idaho hatchery chinook salmon, including those from LSRCP and Idaho Power Company facilities, ranged from 2.4% for a group of spring chinook salmon parr released into Squaw Creek (Clearwater River tributary) in August 1993 to 58.0% for a group of spring chinook smolts released from the Powell satellite facility (Clearwater River).

INTRODUCTION

The U.S. Army Corps of Engineers built four hydroelectric dams (Ice Harbor, Lower Monumental, Little Goose, and Lower Granite) on the lower Snake River between 1962 and 1975. Fishery managers and biologists expected the survival of downstream migrating smolts and upstream migrating adults to be reduced by the dam construction and operation and alteration of the river ecosystem. The Lower Snake River Compensation Plan (LSRCP) was authorized by the Water Resources Development Act of 1976 (90 Stat. 2917) to compensate for the reduced survival and anadromous fish losses caused by dam construction and operation. The primary compensation tool specified in the LSRCP was a hatchery mitigation program. In 1977, the United States Fish and Wildlife Service (USFWS) was given budgeting and administration responsibility for operation and maintenance funding of LSRCP fish hatchery programs through an interagency agreement among the U.S. Army Corps of Engineers, National Marine Fisheries Service, and the USFWS.

The LSRCP hatchery program specifies the use of hatcheries to produce and release large numbers of juvenile anadromous salmonids to meet adult return goals. Adult return goals for the entire LSRCP are 8,000 summer chinook salmon, 50,700 spring chinook salmon, 18,300 fall chinook salmon, and 55,100 steelhead trout to the Snake River basin. The majority of fish in the adult return goals are identified as returns to Idaho waters. Adult return goals for Idaho are 8,000 summer chinook salmon, 40,560 spring chinook salmon, and 39,121 steelhead trout. To achieve these goals, the Idaho Department of Fish and Game (IDFG) and the USFWS currently operate six hatcheries with five satellite facilities: McCall Fish Hatchery and the South Fork Salmon River trap; Dworshak National Fish Hatchery; Clearwater Anadromous Fish Hatchery and the Red River, Crooked River and Powell satellite facilities; Sawtooth Fish Hatchery and the East Fork Salmon River trap; Hagerman National Fish Hatchery, and Magic Valley Steelhead Hatchery (Figure 1). The Powell and Crooked River satellite facilities were the most recent to come online and became fully operational in 1989 and 1990, respectively. Clearwater Anadromous Fish Hatchery, the final hatchery authorized under the LSRCP, became operational in 1992 and will assume the role previously filled, in part, by Dworshak National Fish Hatchery.

The LSRCP included a Hatchery Evaluation Study (HES) component to monitor and evaluate the mitigation hatchery program. The primary objective of the Hatchery Evaluation Study is to determine the best hatchery management practices that allow the mitigation hatcheries to meet LSRCP and IDFG anadromous fisheries goals. Only if we understand the effects of hatchery operations on adult return characteristics (e.g., return rates, sex ratios, age structure) can we prescribe effective management actions. Tasks we defined to satisfy the primary objective are divided into two categories: 1) monitoring and documentation and 2) investigation. We monitor and document hatchery practices for each brood year or cohort of fish and status of annual adult return goals. Our success at achieving LSRCP and IDFG goals can then be related to hatchery practices. Investigation tasks are manipulative experiments involving modified or alternative hatchery practices, which show potential for increasing adult returns and achieving LSRCP and IDFG goals.

This report summarizes chinook salmon Hatchery Evaluation Studies activities carried out from October 1, 1993 through September 30, 1994. Specific objectives identified in Cooperative Work Agreement 14-48-0001-94500 and covered in this report are as follows.

Objective 1. Document the success of the IDFG-LSRCP program in meeting specific adult return goals.

Objective 2. Identify factors limiting hatchery success and recommend possible improvements based on existing knowledge and experimentation.

Sub-objective 2.1 Continue ongoing documentation and monitoring to determine the relationships between adult returns and hatchery practices, characteristics of hatchery products, and juvenile survival.

Sub-objective 2.2 Conduct controlled studies (short-term experiments) to determine the relationships between adult returns and hatchery practices, characteristics of hatchery products, and juvenile survival.

The results of experiments performed under sub-objective 2.2 are printed separate from this report. Some results from those experiments, such as juvenile migration characteristics and adult return rates for experimental groups, are included in this report.

METHODS

IDFG-LSRCP Program Success Documentation

The success of the Idaho component of the LSRCP program was determined by comparing the return of adults in 1994 to the program goal. Also, the success of individual hatchery programs at meeting their goals was determined. Juvenile releases that contributed to the 1994 return were compared to annual hatchery release targets. Parr and presmolt release numbers were converted to smolt equivalents using the multipliers 0.75 and 0.90, respectively. The total releases include only fish considered part of the compensation program release. Fish released from LSRCP facilities as part of other programs or studies were not included. This information is provided in the summary section, to serve as an overall evaluation of the success of the IDFG-LSRCP program.

Hatchery Operations Documentation

Selected hatchery operations information for brood year 1992 juvenile rearing and release and brood year 1994 spawning protocols was obtained from written and oral communication with hatchery personnel. Written documents from which we extracted relevant information included hatchery "Run" and "Brood Year" reports, monthly summaries, stocking slips, and memoranda pertinent to trapping, spawning, rearing, and release operations. Personal communications through formal and informal meetings provided additional information. We attempted to avoid duplication of hatchery documents while highlighting information (e.g., fish health) that may affect adult return characteristics. Documentation included numbers of eggs taken; numbers, size, weight, strain, and health of fish on hand; tagging or marking of experimental groups; and number of fish released and site of release.

Composition of Brood Year 1994 Adult Returns

Age Determinations—We used a variety of methods to determine the age composition of adult returns to the various facilities. We aged fish according to the following hierarchy of methods. Coded-wire tags provided the known age of fish from which tags were recovered. Ventral fin clips provided a fairly reliable estimate of age, because in many cases we have been alternating left and right clips annually at hatcheries. We read scales to determine the ages of the externally unmarked South Fork Salmon River salmon sampled at the weir and on spawning grounds (n=196). Lastly, we deferred to length-frequency distributions for runs trapped at each weir to age fish for which we had no other options. When possible, we relied on the length-frequency distribution of known-age fish (coded-wire-tagged or fin clipped) or fish we aged from scales to help us categorize fish whose length fell in areas of overlap between age groups. We obtained length data from the Coordinated Information System (CIS) database (for McCall and Sawtooth Fish hatcheries) and from the databases kept by hatchery personnel (Clearwater Anadromous Fish Hatchery). We obtained the CIS information either from hatchery or IDFG Fisheries Bureau personnel. The length criteria we used to age the 1994 rack returns may have differed from that used by hatchery personnel who typically rely on the historic (static) criteria (Table 1). Therefore, our age estimates may differ from those reported by hatchery personnel.

We melded data from the CIS database, the hatchery database, and our own database to estimate the composition by age, sex, and origin of the South Fork Salmon River rack returns. Length and sex composition data differ between the CIS and hatchery databases, because the data are collected at different times: the CIS database at trapping time and the hatchery database at spawning time. Between trapping and spawning time, fish tend to decrease in length and develop dimorphic secondary sexual characteristics. The absence of well-developed sex characteristics, especially in the early portion of the run, makes accurate sexing of fish impossible at trapping time. Our estimate of run composition reflects the hybridization of these databases and an expansion of the results to the entire run.

The age notations we use throughout the text and tables for adults that returned in 1994 refer to the total age of the fish. Three-year-old fish originated from releases of brood year 1991 progeny, four-year-olds originated from releases of brood year 1990 progeny, and five-year-olds originated from releases of brood year 1989 progeny.

Scale Collection and Processing—We, along with hatchery and management personnel and tribal biologists, collected scales from fish at the hatchery rack and from natural/wild spawner carcasses on the South Fork Salmon River. Scale collection methods were standardized to reduce sampling variability. Scales were pressed at 230°F for 70 seconds at 10,000 pounds per square inch. Project biologists and bio-aides read each scale sample at least twice.

Sex Composition—Except for the case of the South Fork Salmon River rack returns, the sex composition data we report is that provided by hatchery personnel. We attempt to correct for sex misclassification of the South Fork run based on information provided by hatchery personnel after spawning operations are complete. Sex ratios were calculated for total returns both including and excluding jacks (three-year-old males) and for specific age groups where appropriate.

Fish Origin—We classified any chinook salmon bearing an external mark, typically an adipose or ventral fin clip, or an internal mark, (Oxytetracycline [OTC], present only in South

Fork Salmon River returns) as hatchery fish. We examined vertebrae from a sample of 174 externally unmarked fish recovered at the South Fork Salmon River rack, fish either ponded for hatchery production or released above the weir, to determine the presence (hatchery fish) or absence (hatchery or natural fish) of an OTC mark. (OTC-marked and coded-wire-tagged fish are part of the marking experiment in progress at McCall Fish Hatchery.) We then used scale pattern analysis to determine the origin of unmarked fish and expanded these data to estimate the number of unmarked hatchery fish among those trapped at the rack.

Brood Year 1989 Smolt-to-Adult Return Rates

Within the text we identify releases as fry, parr, presmolts, or smolts, and provide release-to-return estimates based on this terminology. The terms fry, parr, and presmolts refer to chinook salmon in their first spring, summer, or fall of life, respectively. Smolts are juveniles released in their second spring of life. Typically, we are unable to provide return rates for fry and parr, because these fish are not marked or the numbers marked are insufficient for statistical analysis. Most hatchery chinook salmon in Idaho and throughout Columbia Basin are released as smolts. Commonly, a large number of these smolts are marked. Therefore, smolt-to-adult return rate (SAR) of marked fish, the number of marked fish returning divided by the number of marked fish released, is the most commonly used estimator of performance, and is assumed to represent overall smolt-to-adult survival. Lastly, although we freely use the term smolt in reference to yearling hatchery fish, some fish show no signs of smoltification at release and may not emigrate as anticipated.

We generally present two estimates of smolt-to-adult return, hereafter referred to as minimum and maximum estimates, that we believe bound the actual survival rate of hatchery fish. The minimum estimate is the return rate based on marked fish only. Most frequently minimum estimates are based on coded-wire-tagged groups. Occasionally return rates of other marked groups (e.g., left ventral fin clipped groups) are used. The adult return numbers we used included fish trapped at weirs and in some cases, fish recovered on spawning grounds below weirs. Personnel from the IDFG Coded-Wire Tag laboratory in Lewiston and the hatcheries provided marked fish information.

When calculating minimum estimates using coded-wire tag data, we included marked fish (adipose clipped) that we assumed had lost their tags. We assumed fish that had lost tags were from the hatchery at whose rack they were recovered and were not strays. We assigned these fish to an age class (cohort) based on length. If assigning a specific tag code to these fish was necessary for more detailed analyses, we did so based on estimated fish age and the proportion of adult returns recovered within each tag code.

The maximum SAR is estimated as the ratio of the total rack returns (and spawning grounds and fisheries when possible) to the total number of smolts released in a given brood. The estimate is probably positively biased because rack returns may include naturally-produced fish, strays, or returns from fry, parr, or presmolt releases. We assume fry, parr, and presmolt releases do not significantly contribute to adult returns unless we have information from marked releases that indicates otherwise.

We refined our SAR estimates for brood year 1989 McCall Fish Hatchery summer chinook salmon released in the South Fork Salmon River by including scale pattern information (age and origin) and preliminary data from the marking experiment in progress at McCall Fish Hatchery. This additional information, not available from other hatchery sites, allowed us to identify natural returns from that brood.

Juvenile Migration Conditions

Snake River flow during smolt migration is probably a major factor affecting survival of Idaho's anadromous fishes. River flows during emigration periods for brood year returns completed in 1994 are of particular interest for this reporting period. Specifically, flow conditions during the 1991 emigration of brood year 1989 chinook salmon are briefly discussed. Also, flow conditions for the 1994 emigration period for brood year 1992 chinook salmon are reported. We obtained the data from Fish Passage Center (FPC) reports and by personal communication with other IDFG biologists.

Two periods were defined to summarize flows at Lower Granite Dam. The "peak" period, April 15-May 5, is defined as the period of time during which 50% of the emigration of yearling chinook salmon occurs. The "extended" period, April 20-May 30, includes most of the known migration of wild and natural yearling chinook salmon (Petrosky 1991).

Migration Timing and Juvenile Survival

We retrieved PIT (Passive Integrated Transponder) tag data from the PTAGIS database maintained by the Pacific States Marine Fisheries Commission in Gladstone, Oregon. These data pertain to hatchery and natural fish PIT-tagged by various entities for numerous purposes and were used to assess migration survival and timing.

The detection (interrogation) rate of PIT-tagged juvenile salmonids at lower Snake River dams serves as relative or minimum survival index. The index is considered relative or minimum because: 1) an unknown (but we believe small) number of PIT-tagged fish that die in the hatchery may go undetected, although we scan the dead fish; 2) not all fish pass through detectors; 3) some PIT tags fail (approximately 2%, R. Kiefer, IDFG, personal communication) or are lost between tagging and arrival at detection sites; 4) some fish arrive while detection gear is not being operated; and 5) mortality occurs between dams.

We compared the relative survival of fish from various groups of hatchery and natural juveniles arriving at the dams with interrogation capabilities. We restricted our comparisons to groups of fish arriving at similar times because seasonally varying flow and spill conditions affect sampling rates, making comparisons of groups arriving at different times inappropriate. Also, if a fish was detected at more than one dam or more than once at the same dam we used the first detection. Fish that are detected at any one of these dams are counted as survivors to Lower Granite Dam.

We used graphic analyses to determine if arrival timing patterns were similar among release groups. Detection rates reflect the total number of first detections of individual fish at any of the detection sites: Lower Granite, Little Goose, Lower Monumental, or McNary dam. We present arrival timing graphs for various PIT tag groups for comparative purposes. These graphs are constructed from detections at Lower Granite Dam only. In the case of releases which occur over an extended period of time, such as volitional releases, we used the middle date of the release period as the date from which to calculate travel times, because we could not determine the exact date on which each fish left the raceways or ponds.

Progeny:Parent Ratios

The female progeny:parent ratio is the number of adult females returned to the rack for each female used in a given brood year's spawning. The number of females used includes all females spawned, those that die prior to being spawned, and those killed but not spawned. Some error is introduced into the ratio estimate because of inaccurate sexing of adults at the time of trapping. Also, adult returns at hatchery racks included unmarked natural-origin fish and unmarked hatchery-reared fish. We attempted to estimate the number of natural-origin fish among those trapped at the South Fork Salmon River trap.

RESULTS

Summary of Releases

Brood Year 1992

Idaho-LSRCP hatchery facilities operated by IDFG released 777,771 spring chinook salmon smolts, 22,246 spring chinook salmon psmolts, and 1,060,163 summer chinook salmon smolts, bound to emigrate in spring 1994, during the reporting period (Table 2 and Appendix A). All chinook salmon juveniles from the 1992 brood were fin clipped to provide recognition of hatchery-origin returning adults. Other marks or tags may have been applied to a portion of some releases from each hatchery for ongoing experiments.

Brood Year 1993

McCall Fish Hatchery released 96,162 brood year 1993 parr and psmolts in July and August 1994 (Table 2). Clearwater Anadromous Fish Hatchery released 1,352,077 parr and psmolts to Clearwater River tributaries in August and September 1994.

Summary of Adult Returns

Spring Chinook Salmon

The count of adult spring chinook salmon crossing Lower Granite Dam in 1994 was 3,120 (Table 3). This count includes 46 jacks or three-year-old males. Also, an estimated 1,416 of these fish were wild or natural origin. The adult count in 1994 was only 15% of the number of adult spring chinook salmon counted at the dam in 1993.

Returns to all Idaho hatchery racks, including fish of hatchery or natural origin, totaled 854 spring chinook salmon (Table 4); this return was only 9.9% of the 1993 return of 8,620 fish. Returns to Idaho-LSRCP hatchery racks totaled 328 spring chinook salmon, or 12.9% of the 1993 LSRCP rack returns. A total of 526 spring chinook salmon returned to non-LSRCP Idaho hatcheries (Kooskia National Fish Hatchery, Rapid River Hatchery, and Oxbow Fish Hatchery).

Summer Chinook Salmon

The count of adult summer chinook salmon crossing Lower Granite Dam in 1994 was 795 (Table 3). This count includes 81 jacks or three-year-old males. Also, an estimated 305 of these fish were wild or natural origin. The adult count in 1994 was only 10% of the number of adult summer chinook salmon counted at the dam in 1993.

Returns to all Idaho hatchery racks, including fish of hatchery or natural origin, totaled 563 summer chinook salmon (Table 5); this return was only 20% of the 1993 return of 2,872 fish. Returns to Idaho-LSRCP hatchery racks totaled 527 summer chinook salmon, or 19% of the 1993 LSRCP rack returns. Thirty-six summer chinook salmon were counted at the Pahsimeroi Hatchery rack.

Hatchery Operations

McCall Fish Hatchery

Brood Year 1992 Juvenile Rearing and Release—McCall Fish Hatchery released 1,060,163 summer chinook salmon smolts into the South Fork Salmon River in 1994 (Table 2, Appendix A Table 1). Green egg to smolt (release) survival of brood year 1992 summer chinook salmon reared at McCall Fish Hatchery was 74.2% (Table 6). An epizootic of aeromonads and psuedomonads caused the relatively high mortality, much of which occurred in August 1993. Oxytetracycline (TM-50) treatment did not reduce mortality. A regularly scheduled erythromycin treatment in September 1993 appeared to reduce mortality; however, subsequent marking (coded-wire tagging and adipose fin clipping), also in September, appeared to cause some chronic mortality. The presence of bacterial kidney disease (BKD) was confirmed in December 1993. Following a third erythromycin treatment in January 1994, signs of BKD were reduced and fish appeared healthy at the preliberation assessment (IDFG, Annual Report, National Marine Fisheries Service Permit #921).

1994 Adult Return—A total of 527 adult summer chinook salmon were trapped at the South Fork Salmon River facility in 1994, which included 277 females and 250 males (Table 7). We trucked 53 adults (26 males and 27 females) to two release sites in the Stolle Meadows reach of the river during July and August to seed that underutilized historic spawning area. Sankovich and Hassemer (1999) described the spawning distribution of the adults outplanted. Male returns included 72 three-year-olds, 31 four-year-olds, and 147 five-year-olds. Female returns included 13 four-year-olds and 264 five-year-olds (Table 8).

Fisheries Contribution—Shoshone-Bannock tribal members harvested six hatchery and two wild (unmarked) summer chinook salmon from the South Fork Salmon River in 1994 (IDFG files). No sport fisheries occurred in the South Fork Salmon River in 1994.

Brood Year 1994 Spawning Protocols—All adult chinook salmon trapped were injected interperitoneally with erythromycin 200 (Gallimycin) at either a low (10mg/kg) or high (20mg/kg) rate. Fish released above the South Fork Salmon River trap were injected with the low dosage. The eggs of each female were divided in half (approximately) and each half was mixed with milt from two different males. At McCall Fish Hatchery, 139 females were spawned with 88 males, including eight jacks. The shortage of males necessitated the use of some males up to four times. In keeping with our broodstock management strategies for supplementation initiatives, marked and unmarked fish were not interbred (McPherson 1994).

Mark/Tag Recovery—Idaho Department of Fish and Game personnel recovered coded-wire tags from 190 of 223 snouts (85.2%) collected at the rack (Appendix B Table 1). An additional seven coded-wire tags were recovered from snouts of eight fish collected on spawning grounds below the weir by Nez Perce tribal biologists. All coded-wire tags retrieved bore codes corresponding to fish of McCall Fish Hatchery origin. We determined, based on length criteria, that adipose-clipped fish which should have had coded-wire tags but from which no tags were recovered included six five-year-olds, one four-year-old, and 16 three-year-olds. The high percentage of "no tags" among the three-year-old returns ($16/59=27\%$) is puzzling. Only about 8,660 ad-clipped-only fish were released in the brood year 1991 group. Assuming these 16 fish were returns from the ad-clipped-only group (i.e., not fish that lost coded-wire tags) implies that ad-only fish returned at a rate of 0.185%, a return rate five times greater than the coded-wire-tagged fish. Other possible explanations include: high tag loss among coded-wire-tagged fish, unmarked fish being misread as adipose-clipped fish, or detector malfunction.

About 7.4% of the coded-wire-tagged five-year-old fish would have been misclassified as four-year-olds if only length criteria were used (Appendix B, Table 1). Two of the six four-year-old fish from which coded-wire tags were recovered would have been misclassified as five-year-olds. No three-year-old coded-wire-tagged fish (nor any of the 16 "no tags") were longer than 65 cm fork length.

Three PIT-tagged fish, including one brood year 1989 OTC/PIT male (marking/handling experiment), one brood year 1989 naturally-produced male tagged by National Marine Fisheries Service personnel, and one brood year 1991 CWT/AD/PIT male tagged by IDFG for Fish Passage Center monitoring purposes, were detected at the South Fork Salmon River rack in 1994.

Brood Year 1989 Smolt-to-Adult Return Rate—We estimated 1,579 summer chinook salmon of hatchery origin returned from a release of 708,600 brood year 1989 smolts, yielding a combined SAR for marked and unmarked groups of 0.2228% (Table 9). The estimated SARs for brood year 1989 coded-wire-tagged (and adipose-clipped) and OTC-marked fish were similar at 0.1941% and 0.1815%, respectively.

The SAR for unmarked hatchery fish from the 1989 brood at McCall Fish Hatchery was 0.7926%. We believe this SAR was substantially overestimated since it is much higher than any SAR we have seen in the recent past for Idaho hatchery chinook salmon. Assuming that OTC has no negative effect on survival, SARs for the two groups, OTC and unmarked hatchery fish, should have been similar. Our most likely explanation for the discrepancy, which we cannot substantiate, is that we failed to detect the OTC mark in vertebrae of some externally unmarked fish that were OTC-marked. In fact, we detected the OTC mark in 25 of 26 (96.2%) known OTC-marked (CWT/OTC) fish from the 1991 brood. Assuming unmarked and OTC-marked fish perform similarly, the combined SAR for these two groups would be 0.244%. This issue will be discussed in more detail in the final report for the mark evaluation study.

Sawtooth Fish Hatchery and East Fork Salmon River Satellite

Brood Year 1992 Juvenile Rearing and Release—A significant epizootic, the exact cause of which remains unclear, resulted in low egg-to-smolt survival rates (45.7% for Sawtooth stock and 40.6% for East Fork stock, Table 6) of the brood year 1992 fish reared at Sawtooth Fish Hatchery. Mortality associated with the epizootic began following the simultaneous

adipose fin clipping and transfer of fish from inside vats (well water) to outside raceways (river water). Stressful events appeared to exacerbate the problem. Fish health personnel isolated two species of bacteria, *Aeromonas hydrophila* and *A. sobrina* from dead fish. *Saprolegnia*, which was isolated later in the rearing cycle, appeared to become the primary pathogen, attacking apparently healthy fish. Oxytetracycline appeared ineffective against *A. sobrina* and *Saprolegnia*. Scheduled erythromycin treatments seemed to reduce mortality rates. Mortality rates were highest in December 1993 and January 1994 with lesser occurrences in July and August.

Sawtooth Fish Hatchery released about 213,900 and 12,400 brood year 1992 smolts to the Salmon River and to the East Fork Salmon River, respectively, in April 1994 (Table 2; Appendix A, Table 4). Salmon River releases included 72,300 smolts trucked to the upper Salmon River for the Idaho Supplementation Studies. All supplementation fish were marked with a left ventral fin clip and a portion of these were PIT tagged. The releases to the Salmon River also included approximately 22,000 smolts categorized as high BKD. These smolts were the progeny of females that had ELISA values greater than 0.5 when tested at the time of spawning.

Volitional Release Testing—We attempted to identify and segregate brood year 1992 juvenile chinook salmon for possible fall release by allowing fish to move volitionally from the upper to lower sections of the raceways. Fish that moved to the lower sections were designated for fall release pending approval for release by the National Marine Fisheries Service. Between October 28 and November 19, 1993, raceways were equipped with a six-inch PVC outlet pipe to allow passage from the upper to the lower sections. Raceways containing PIT-tagged fish were equipped with PIT tag monitors to allow identification of PIT-tagged fish in the potential fall release group and to provide an estimate of the proportion of fish that moved. We assumed the behavior of PIT-tagged fish was representative of the raceway population. Efficiency of PIT tag detectors ranged from about 85% to 95%, so we did not obtain exact count of fish that moved.

We estimated that at least 44% of the fish moved from the upper to lower sections during the fall volitional movement period. For the nine raceways we monitored, estimates ranged from 29% to 71% (mean=43.9%, SD=13.8%). Most fish moved during the first few hours after dark on the first day movement was facilitated.

We did not receive approval from the National Marine Fisheries Service for a fall release of the fish that volitionally moved to the lower sections. Therefore, for fish culture reasons, crowder screens were used to move fish in the lower sections back into the upper sections. This task was accomplished on November 15 and 16, 1993.

In spring 1994 we again allowed fish to move from upper to lower sections and monitored PIT-tagged fish. This procedure, along with that conducted in the previous fall, provided us with four groups of PIT-tagged fish: 1) fall movers, 2) spring movers, 3) spring and fall movers, and 4) non-movers.

1994 Adult Return—Ninety-six adult chinook salmon, including 56 males and 40 females, were trapped at the Sawtooth weir in 1994 (Table 7). Returns of marked fish included 27 adipose-clipped and 25 left ventral clipped fish (Appendix B, Table 4). Six coded-wire tags, representing five different tag codes, were recovered from 14 snouts collected. These 14 snouts were taken from seven adipose-clipped fish that presumably contained coded-wire tags, one unmarked fish, and six left ventral clipped fish. The unmarked and left ventral clipped fish should not, and did not, contain coded-wire tags. Six adipose-clipped five-year-old fish (based

on length), four males and two females, were released above the weir to increase the number of natural spawners. These six fish were likely returns from the rearing density experiment; however, no snouts were recovered from which to obtain coded-wire tags. Male returns included six three-year-olds, 37 four-year-olds, and 13 five-year-olds. Female returns included 27 four-year-olds, and 13 five-year-olds (Table 8).

Fifteen adult chinook salmon, 11 males and four females, were trapped at the East Fork Salmon River weir in 1994 (Table 7). All were released above the weir. No three-year-olds were trapped. No marked fish were trapped. Thirteen of the 15 fish trapped were from brood year 1989 (Table 8); none of the juveniles in this release were marked. We suspect the two brood year 1990 fish in the run were of natural origin, because all of the hatchery fish in that brood were marked.

Brood Year 1994 Spawning Protocols—The eggs of each female were divided in half (approximately) and each half was mixed with milt from two different males. At Sawtooth Fish Hatchery, seven females were spawned with 18 males. Twelve of these males were then released.

Brood Year 1989 Smolt-to-Adult Return Rate—An estimated 129 adults of brood year 1989 origin were trapped at the Sawtooth weir in 1992, 1993, and 1994. These adults resulted from a release of 650,600 smolts and from natural production. The maximum smolt-to-adult return rate for hatchery fish of this brood, assuming all adults were of hatchery origin, was 0.0198% (Table 9). The estimated smolt-to-adult return rate for coded-wire-tagged smolts was 0.0061%. Seventy-three females were released above the weir in 1989.

Forty-seven adult chinook salmon of brood year 1989 were trapped at the East Fork Salmon River trap in 1992-1994. These adults returned from a release of 98,300 smolts and natural production. The estimated maximum SAR for the 1989 East Fork Salmon River hatchery brood was 0.048% (Table 9).

Crooked River Satellite (Clearwater Anadromous Fish Hatchery)

Brood Year 1992 Juvenile Rearing and Release—No adult chinook salmon were spawned from Crooked River in 1992. Adult chinook salmon trapped at Lookingglass Fish Hatchery (Rapid River stock) in excess to their needs were spawned on two separate days to provide green eggs for Crooked River. Two spawning days provided 336,401 green eggs. Fish were spawned at Lookingglass Fish Hatchery and green eggs were transported to Clearwater Anadromous Fish Hatchery. The total number of eyed eggs was 315,208 for an eye-up rate of 93.7% (Table 6). Fish were reared from the egg to smolt stage at Clearwater Anadromous Fish Hatchery. Fish were trucked to and placed in rearing ponds at the satellite facility on March 21, 1994. Approximately 273,800 smolts were released into Crooked River at the satellite site in April 1994; the estimated green egg to smolt survival was 81.3% (Table 6). Volitional releases occurred from April 9 to 14. Fish remaining in the ponds after April 14 were forced to enter the river between April 15 and 19. Representative groups of fish from each of these release types were PIT tagged daily as they were trapped in Crooked River by IDFG Intensive Smolt Monitoring project personnel. Approximately 100 fish were PIT tagged each day until most of the fish had passed the trap.

1994 Adult Return—The 26 adult spring chinook salmon trapped at the Crooked River facility in 1994 included eight males and 18 females (Table 7). Ages of the females trapped

were one three-year-old (based on length <63 cm), 13 four-year-olds, and four five-year-olds. Two of the eight returning males were four-year-olds, the remaining six were five-year-olds (Table 8). Marked returns included one brood year 1989 coded-wire-tagged male and five brood year 1990 left ventral fin clipped fish, two males and three females (Appendix B Table 3).

Brood Year 1989 Smolt-to-Adult Return Rate—The SAR for the 64,146 coded-wire-tagged brood year 1989 presmolts released in fall 1990 was 0.0016% (Table 9). If the unmarked returns from brood year 1989 represented only hatchery fish, the SAR for these unmarked fish (0.0405%) was 26 times greater than that of the marked fish.

Powell Satellite (Clearwater Anadromous Fish Hatchery)

Brood Year 1992 Juvenile Rearing and Release—A total of 521,014 green eggs were taken from brood year 1992 females; fecundity was estimated at 4,070 eggs per female. Green egg to smolt survival (based on presmolt to smolt survival of 95%) was estimated at 76.6% (Table 6). The approximately 261,619 brood year 1992 smolts released from the Powell satellite facility in spring 1994 included fish from the natural rearing treatment and control groups and one high BKD group (Table 2 and Appendix A, Table 3). The treatment- or naturally-reared fish groups were reared at Clearwater Anadromous Fish Hatchery in raceways that contained overhead covers and had camouflage-painted walls and floors. The control- or traditionally-reared groups were reared in raceways with no cover or camouflage paint. In addition, 144,863 presmolts were released into Lochsa River tributaries from BY92 females. All smolts were progeny of fish trapped at the Powell facility and were reared at Clearwater Anadromous Fish Hatchery from the egg to smolt stage. Both the natural-reared and traditional-reared groups were either released directly into Walton Creek (nonacclimated) or were released from the Powell ponds into Walton Creek following about 14 to 21 days of acclimation (acclimated).

The fish in the high-BKD group were the progeny of females that had ELISA values greater than 0.5 when tested for BKD at the time of spawning. A separate group of Powell-origin smolts was released into Papoose Creek (Table 2), a tributary of the Lochsa River about 8 km downstream of the Powell satellite. These fish were the progeny of females that had ELISA values ranging from 0.1 to less than 0.25 when tested, and were categorized as low-BKD. Fish for the Papoose Creek release were reared with cover but not in camouflaged raceways.

1994 Adult Return—Adult returns to the Powell satellite facility included 31 males and 55 females (Table 7). Ages of the females trapped were 18 four-year-olds and 37 five-year-olds. Male returns included one three-year-old, 10 four-year-olds, and 20 five-year-olds (Table 8).

Marked fish returns included nine coded-wire-tagged, six ad-clipped only (lost coded-wire tag), one right ventral/adipose fin clipped, and one left ventral clipped fish (Appendix B Table 3). Seven of eight coded-wire-tagged four-year-old fish trapped at Powell (code 052206) were from a group of 64,200 smolts reared at Kooskia National Fish Hatchery and released at the mouth of Papoose Creek, a Lochsa River tributary located about 8 km downstream of the Powell trap.

Brood Year 1989 Smolt-to-Adult Return Rate—An estimated 242 adults (assuming all were of hatchery origin) returned from the 307,104 presmolts and 180,764 unmarked smolts

released in fall 1990 and spring 1991, respectively. The combined smolt-to-adult return rate for the two groups was 0.05% (Table 9). We cannot estimate separate return rates for presmolts and smolts since they were not marked. The SAR of coded-wire-tagged presmolts was 0.01%.

Red River Satellite (Clearwater Anadromous Fish Hatchery)

Brood Year 1992 Juvenile Rearing and Release—A total of 22,864 green eggs were taken from brood year 1992 females; fecundity was estimated at 3,810 eggs per female. An estimated 22,246 brood year 1992 presmolts were released in October 1993 (Table 6, Appendix A, Table 3). We did not calculate an egg-to-release survival for these fish, as the estimated number of eggs surviving to the eyed stage was less than the estimated number of presmolts released (Table 6). We hypothesis the green egg take estimate was low based on the relatively low fecundity reported.

1994 Adult Return—Thirty-one adult spring chinook salmon, including 18 males and 13 females, were trapped at the Red River satellite facility in 1994 (Table 7). No three-year-old fish were trapped in 1994. Ages of the females trapped were nine four-year-olds and four five-year-olds. Male returns included nine four-year-olds and nine five-year-olds (Table 8). Marked returns included one four-year-old left ventral clipped female and one five-year-old coded-wire-tagged male (Appendix B, Table 3).

Brood Year 1989 Smolt-to-Adult Return Rate—The combined SAR for the three brood year 1989 coded-wire-tagged presmolt groups, a total of 62,499 fish, was 0.0096% (Table 9, Appendix A, Table 3). Smolt-to-adult return rates were similar among the three groups of approximately 20,000 fish each.

Dworshak National Fish Hatchery

Information pertaining to the LSRCP program at Dworshak National Fish Hatchery is reported in a separate text (Miller et al. 1994). We include selected information in this report for comparative purposes. Marking and release information and return information for Dworshak National Fish Hatchery spring chinook salmon is included in Appendix A, Table 2.

1994 Adult Return—Seventy-four adult spring chinook salmon were trapped at the Dworshak National Fish Hatchery rack on the North Fork Clearwater River in 1994 (Table 7). Male returns consisted of two, 10, and 21, three-, four- and five-year-olds, respectively. Female returns included 21 and 18 four- and five-year-olds, respectively. Age and/or sex for two fish was unknown (Table 8).

Mark/Tag Recovery—Coded-wire tags recovered from 50 fish trapped at Dworshak and Kooskia hatchery racks included 20 brood year 1989 five-year-olds and 30 brood year 1990 four-year-olds (Appendix B, Table 2). Notably, seven salmon from the 1990 brood at Dworshak/Kooskia National Fish Hatchery (reared at Kooskia National Fish Hatchery, coded-wire tag code 052206) were trapped at the Powell satellite facility in 1994. One additional fish of this code was trapped at either Dworshak or Kooskia National Fish Hatchery. These eight four-year-old fish, which included two males, five females, and one fish of unknown sex, returned from a 1992 release of 64,171 smolts to the mouth of Papoose Creek, about eight kilometers downstream of the Powell facility. No marked fish were observed during spawning ground surveys conducted by Nez Perce Tribal personnel on Papoose Creek (J. Hesse, Nez Perce Tribe, personal communication).

Brood Year 1989 Smolt-to-Adult Return Rate—Smolt-to-adult return rates for Dworshak National Fish Hatchery brood year 1989 smolts ranged from 0.0093% for high BKD coded-wire-tagged smolts to 0.0806% for unmarked smolts (Table 9). Smolt-to-adult return rates for fish reared at low, medium, and high densities, were 0.0433%, 0.0284%, and 0.0307%, respectively.

Brood Year 1989 Progeny:Parent Ratios

Female progeny:parent ratios for brood year 1989 LSRCF hatchery chinook salmon (for which we could provide estimates) ranged from 0.29:1 for Red River satellite to 4.51:1 for McCall Fish Hatchery (Table 10). Only at McCall hatchery did the number of females that returned for the entire cohort exceed the number spawned in 1989.

Juvenile Migration Conditions

Brood Year 1989

Mean daily flows at Lower Granite Dam in 1991 (emigration year for brood year 1989 chinook salmon) were 44 kcfs during the "peak" (April 15 to May 5), and 70.5 kcfs during the "extended" (April 20 to May 30) migration periods (Table 11). Daily flows throughout the 1991 emigration period are shown in Figure 2.

Brood Year 1992

Mean daily flows at Lower Granite Dam in 1994 (emigration year for brood year 1992 chinook salmon) were 64.1 kcfs during the "peak" (April 15 to May 5), and 77.5 kcfs during the "extended" (April 20 to May 30) migration periods (Table 11). Daily flows throughout the 1994 emigration period are shown in Figure 3.

Migration Timing and Juvenile Survival for 1994 Emigration

General

The following discussion of PIT tag data refers to groups of Idaho-LSRCF and Idaho Power Company hatchery chinook salmon parr, presmolts and smolts destined to migrate in 1994. PIT tag detection rates at Lower Snake River dams for chinook salmon smolts ranged from 2.4% for fish released as parr into Squaw Creek (Clearwater River tributary) to 69.9% for a group of smolts released from Dworshak National Fish Hatchery into the North Fork Clearwater River (Dworshak National Fish Hatchery data from R. Jones, USFWS, IFRO, unpublished) (Appendix C). In general, detection rates were lower for parr and presmolts than for smolts. Detection rates were less than 11% (2.3% to 10%) for parr and presmolts but ranged from 12.9% to 69.9% for smolts. As in past years, detection rates were inversely related to the distance from release site to Lower Granite Dam (Fig. 4).

Spill at Lower Snake River dams during the 1994 emigration period may have affected detection rates because fish passing the projects via spill were not subjected to detection

equipment. Spill occurred at Snake River dams as follows: Lower Granite, 5/11-6/15; Little Goose, 4/12-4/14, 4/20-6/15; Lower Monumental, 5/11-6/15; and Ice Harbor, 4/10-7/31.

Median travel times from release site to Lower Granite Dam for hatchery chinook salmon smolts (excluding Dworshak/Kooskia fish) ranged from 17 to 32 days (Table 12 and Appendix C). Median arrival dates at Lower Granite Dam for all groups of smolts monitored ranged from April 26 to May 20 (Figures 5-11). The central-ninetieth-percentile-arrival-period for these smolt groups was from May 8 to June 2. Last dates of arrival for smolts varied from May 15 to July 11. Detections at Lower Granite Dam were completed by June 1 for 21 of the 30 groups (70%) analyzed.

Arrival patterns for juveniles released as parr and presmolts (Figure 6) were more protracted than for those of smolts. Median arrival dates for the four parr groups and one presmolt group were relatively early, April 30 to May 11, but there were more late-arriving fish in these groups than in the smolt releases. In only one of these five release groups were detections at Lower Granite Dam completed by June 1 (versus 21 of 30 smolt release groups). Three of the five parr/presmolt groups (versus two of 30 smolt groups) had last arrival dates in July.

For all groups, there was no relationship between median travel time to Lower Granite Dam and distance of the release site from Lower Granite Dam (Figure 12). Also, there was no relationship between median travel time and release date (Figure 13).

McCall Fish Hatchery

Detection rates for five groups of smolts released between April 9 and April 28, 1994 ranged from 25.0% to 39.0% (Table 12 and Appendix C) with an overall average of 32.1%. Detection rates for two smolt treatment groups released near the occurrence of storm events on April 12 and April 22 were not significantly different from those of their two control counterparts released on April 14 and 28 (Chi-square, $\alpha = 0.05$). However, detection rates were higher for early (April 9, 12, 14) than for late releases (April 22, 28). Spill, which occurred at Lower Granite Dam between May 11 and June 15, could have affected detection rates of later arriving groups, although fish spilled at Lower Granite Dam could have been detected at other dams provided they survived the between-dam journey. Median arrival dates for the early groups occurred before May 11, while the median arrival dates of the late releases occurred around May 19 (Figure 5).

Red River Satellite

Presmolts released from the Red River satellite facility were detected at a rate of 6.8% (Table 12 and Appendix C). These were the only presmolts released from IDFG hatcheries represented in the 1994 smolt emigration. The median arrival date at Lower Granite Dam for these fish was May 11, 1994. These fish showed a protracted migration pattern, with one fish arriving as late as July 24 (Fig. 6).

Crooked River Satellite

Detection rates for volitional and forced release groups of smolts varied from 17% to 52.7% (Table 12 and Appendix C). Mean detection rates for the volitional (31.2%) and forced (37.0%) groups were not significantly different (Chi-square, $\alpha = 0.05$). In general, detection rates

decreased from the earliest to latest release (tagging) date within release type (Fig. 7). Median travel time increased for successive releases within the volitional group (17 to 28 days), but was similar among all forced groups (20 to 21 days).

Powell Satellite

Detection rates for individual PIT tag groups released from Powell satellite in spring 1994 ranged from 38.0% (nonacclimated progeny of high BKD females) to 60.8% (acclimated, traditionally reared fish) (Appendix C). Median travel times to Lower Granite Dam varied from 22 to 27 days (Table 12).

The detection rate of acclimated, naturally-reared fish was not different from that of nonacclimated naturally reared groups. Also, the detection rates of acclimated versus nonacclimated traditionally reared fish were not different. Based on our observations, rearing technique (natural versus traditional) had an effect on detection rate for acclimated fish but not for nonacclimated fish. The detection rate for acclimated, naturally-reared fish (overhead cover, camouflage painted raceway walls and floors) was 46.8%, and the detection rate for acclimated, traditionally-reared (control) groups was 58.0% (Table 12, Fig. 8, and Appendix C). These two detection rates were significantly different (Chi-square = 6.06, $\alpha = 0.05$). However, other uncontrolled factors may have affected our ability to detect significant differences for release strategy (acclimated versus nonacclimated) and rearing type (natural versus traditional).

Fish size at release may have confounded our analyses for acclimated groups. Naturally-reared fish averaged 37.7 g at release and traditionally-reared fish averaged 41.3 g. There was a strong linear relationship between fish weight and detection rate ($r^2=0.70$) among the six PIT tag groups examined (Figure 14; S. Patterson, IDFG, unpublished data).

Detection rates of fish released into Papoose Creek for the Idaho Supplementation Studies (low BKD fish) were similar to those of the acclimated naturally-reared and high BKD groups released at Powell (Table 12 and Appendix C). The Papoose Creek release site is about 8 kilometers downstream of the Powell release site.

Sawtooth Fish Hatchery and East Fork Salmon River Satellite

Five groups of fish that had been reared at Sawtooth Fish Hatchery were released in spring 1994: 1) natural-rearing treatment, 2) natural-rearing control, 3) high BKD, 4) fish released to the upper Salmon River for Idaho Supplementation Studies evaluations, and 5) East Fork Salmon River stock. Each group contained a representative sample of PIT-tagged fish. Detection rates for the five groups released ranged from 12.9% to 15.6% (Table 12 and Appendix C). Detection rates were not significantly different among release groups (Chi-square = 2.588, $\alpha = 0.05$). Median travel times for the five groups ranged from 24 to 27 days. The date the last fish was detected at Lower Granite Dam, for all five release groups, was May 25, 1994 (Fig. 9).

SUMMARY

Returns of LSRCP hatchery adult chinook salmon to Idaho in 1994 were substantially less than LSRCP goals. A total of 855 chinook salmon were trapped at Idaho-LSRCP facilities;

the Idaho-LSRCP annual return goal is 48,495 chinook salmon to the project area (above Lower Granite Dam) (Table 13). The total return includes some naturally produced fish; therefore the actual return of fish produced for compensation purposes was less than 855. However, the adult return was not adjusted upward to account for losses occurring between Lower Granite Dam and the trap sites. Adult returns ranged from 0.6% to 6.6% of facility goals (Table 13). Juvenile releases that contributed to the 1994 return of compensation program fish ranged from 16% to 99% of individual facility annual release targets. Average release size for the three years that contributed to the 1994 return ranged from 42% to 74% of release targets.

Table 1. Length criteria (fork length in centimeters) used by LSRCP Hatchery Evaluation Studies (HES) personnel and by hatchery personnel to age chinook salmon in the 1994 run.

	AGE		
	3 ₂	4 ₂	5 ₂
South Fork Salmon River			
HES	<65	65-82	>82
McCall Fish Hatchery	<67	67-89	>89
Historical Criteria	<67	67-94	>94
Clearwater Fish Hatchery			
Powell	<64	64-82	>82
Red River	<64	64-82	>82
Crooked River	<64	64-82	>82
Sawtooth Fish Hatchery	<65	65-82	>82

Table 2. Numbers of spring and summer chinook salmon juveniles released from Lower Snake River Compensation Plan hatcheries operated by the Idaho Department of Fish and Game. Only releases made between October 1, 1993 and September 30, 1994 are included. Smolt releases are from brood year 1992 production; presmolt releases are as footnoted. Specific release locations and numbers released are included in Appendix A.

	Summer Chinook		Spring Chinook		Total
	<u>Smolt</u>	<u>Presmolt</u>	<u>Smolt</u>	<u>Presmolt</u>	
McCall	1,060,163	96,162 ^a			1,156,325
Clearwater			16,110 ^b	1,031,322 ^c	1,047,432
Red River				343,001 ^d	343,001
Crooked River			273,766 ^e		273,766
Powell			261,619		261,619
Sawtooth			213,908		213,908
East Fork Salmon R.			12,368		12,368
Total	1,060,163	96,162	777,771	1,374,323	3,308,419
Grand Total	1,156,325		2,152,094		3,308,419

^a Brood year 1993 summer parr released July and August 1994.

^b Low-BKD group released into Papoose Creek.

^c Brood year 1993 parr and presmolt releases.

^d Brood year 1992 presmolts released October 1993 = 22,246; brood year 1993 presmolts released September 1994 = 320,755.

^e From brood year 1992 green eggs taken at Lookingglass Fish Hatchery and reared at Clearwater Fish Hatchery.

Table 3. Numbers of adult spring and summer chinook salmon counted at Lower Granite Dam, 1979-1994.

Return Year	Lower Granite Dam	
	Spring	Summer
1994	3,120	795
1993	21,035	7,889
1992	21,391	3,014
1991	6,023	3,809
1990	17,315	5,093
1989	12,955	3,169
1988	29,495	6,145
1987	28,835	5,891
1986	31,722	6,154
1985	25,207	5,062
1984	6,511	5,410
1983	9,517	3,885
1982	12,367	4,210
1981	13,115	3,326
1980	5,460	2,688
1979	6,839	2,712

Table 4. Numbers of adult spring chinook salmon returning to Idaho hatcheries, 1967-1994. (DNFH = Dworshak National Fish Hatchery, EFSR = Sawtooth Fish Hatchery satellite facility on East Fork Salmon River)

Year	LSRCP Facilities							Other Facilities			Grand
	<u>DNFH</u>	<u>Powell</u>	<u>Red R.</u>	<u>Crooked R.</u>	<u>Sawtooth</u>	<u>EFSR</u>	<u>Total</u>	<u>Kooskia</u>	<u>Rapid R.</u>	<u>Oxbow</u>	<u>Total</u>
1994	74	86	31	26	96	15	328	232	265	29	854
1993	823	500	139	402	587	90	2,541	1,180	4,468	431	8,620
1992	370	270	39	228	387	64	1,358	312	2,466	912	5,048
1991	165	33	18	20	566	62	864	467	1,913	22	3,266
1990	2,042	179	53 ^a	29	1,488	145	3,936	1,141	2,606	30	7,713
1989	1,700	154	104 ^a		888	128	2,974	973	2,800	84	6,831
1988	1,972		394 ^a		1,485	548	4,399	595	3,780	458	9,232
1987	2,017		519		1,344	272	4,152	687	3,807	543	9,189
1986	516		0		1,769	194	2,479	283	6,273	395	9,430
1985	334		125		1,639	303	2,401	529	6,727	699	10,356
1984	82		111		405	117	715	341	2,356	3	3,415
1983								373	1,958	16	2,347
1982								258	3,676		3,934
1981								247	3,390		3,637
1980								67	1,960		2,027
1979								375	4,361	1	4,737
1978								2,035	5,769		7,804
1977								3,026	8,181		11,207
1976								801	8,107		8,908
1975								326	5,165	14	5,505
1974								53	3,995	1	4,049
1973								50	17,342	2	17,394
1972								5	13,253	3	13,261
1971									5,110		5,110
1970									7,357		7,357
1969									3,860	344	4,204
1968									4,162 ^b		4,162
1967									1,039 ^c		1,039

^a Includes returns from fall releases.

^b Represents data from 3- and 4-year-old returns only.

^c Represents data from 3-year-old returns only.

Table 5. Numbers of adult summer chinook salmon returning to McCall (South Fork Salmon River, LSRCP) and Pahsimeroi (Idaho Power Company) fish hatcheries, 1971-1994.

Return Year	McCall	Pahsimeroi	Total
1994	527	36	563
1993	2,703	169	2,872
1992	2,848	131	2,979
1991	1,212	238	1,450
1990	969	470	1,439
1989	936	347	1,283
1988	2,393	838	3,231
1987	2,705	474	3,179
1986	2,690	345	3,035
1985	2,238	110	2,348
1984	1,530	37	1,567
1983	939	109	1,048
1982	550	ND	550
1981	524	9 ^a	533
1980	380	33 ^b	413
1979	80 ^c	66	146
1978		ND	
1977		558	558
1976		371	371
1975		134	134
1974		155	155
1973		546	546
1972		584 ^d	584
1971		89 ^e	89

^a Represents data from 5-year-old returns only.

^b Represents data from 4- and 5-year-old returns only.

^c Trapped at Lower Granite Dam.

^d Represents data from 3- and 4-year-old returns only.

^e Represents data from 3-year-old returns only.

Table 6. Selected spawning and hatchery production data and in-hatchery survival estimates for brood year 1992 Idaho hatchery spring and summer chinook salmon.

Facility	Female used ^a (spawned)	Male used (spawned)	Green eggs taken	Eyed eggs	Fry produced	Egg-fry surv. %	Parr on July 1	Presmolts released	Smolts released	Smolt equivalents	Egg-smolt surv. %
Summer Chinook											
McCall	428 (325)	538 (330)	1,428,819	1,220,660	1,200,000	84.0	1,091,794	0	1,060,163	1,060,163	74.2
Spring Chinook											
Clearwater						—					
Red R.	6 (6)	7 (7)	22,864	21,937	21,570	94.3			22,246	22,246	- ^b
Crooked R.	0	0	336,401 ^c	315,208		—			273,766	273,766	81.3
Powell	128	127	521,014	473,108	465,137	89.3		144,863	261,619	399,239 ^d	76.6
						—					—
Dworshak						—					—
Kooskia						—					—
Sawtooth	109 (104)	133 (131)	468,297	423,615	420,277	89.7	440,434		213,830	213,830	45.7
						—					—
East Fork SR	7 (7)	18 (18)	30,494	28,168	26,269	92.4	27,406		12,368	12,368	40.6
						—					—
						—					—

^a Used = spawned + prespawn mortalities + killed not spawned.

^b Not calculated, number of smolts released > number of eyed eggs.

^c Green eggs taken at Lookingglass Fish Hatchery (Rapid River stock), and transported to Clearwater Fish Hatchery.

^d Assumes 95% presmolt-smolt survival.

Table 7. Adult return data for spring and summer chinook salmon returning to Idaho hatchery racks in 1994.

Facility	Returns					Spawned			Egg take	Fecundity	Released				
	Female	Male	Jack	Total	Sex Ratio M : F	Female	Male	Jack			Female	Male	Jack	Total	
Spring Chinook															
Rapid River ^a	163	126	5	294	0.8 :1	116	NA	NA	480,876	4,145	0	0	0	0	
Oxbow ^b	0	0	1	1	NA	NA	NA	NA	NA		0	0	0	0	
Dworshak	39	31	2	74 ^c	0.8 :1	31	22	2	124,887	4,029	0	0	0	0	
Kooskia ^d	113	89	1	232 ^e	0.8 :1 ^f	95	75	1	392,427	4,131	0	0	0	25 ^g	
Red River	13	18	0	31	1.4 :1	7	10	0	30,634	4,376	5	8	0	13	
Crooked River	18	8	0	26	0.4 :1	10	7 ^h	0	44,406	4,441	6	0	0	6	
Powell	55	30	1	86	0.6 :1	54	29	0	252,045	4,668	0	0	0	0	
Sawtooth	40	50	6	96	1.4 :1	7	17 ⁱ	1 ^j	31,500	4,500	33 ^k	32 ^k	5	70	
East Fork	4	11	0	15	2.8 :1	0	0	0	0		4	9	2	15	
Total Spring Chinook				855					1,356,775					129	
Summer Chinook														0	
McCall	277	178	72	527	0.9 :1	139	80	8	689,203	4,958	116 ^l	85 ^m	3	204	
Pahsimeroi	16	11	9	36	1.3 :1	0	0	0	0		15	11	9	35	
Rapid River ⁿ	9	14	2	25	1.8 :1	0	0	0	0		9	14	2	25	
Total Summer Chinook				588					689,203					264	

^a Includes fish trapped at Rapid River and Oxbow hatcheries.

^b Trucked to and spawned at Rapid River Hatchery.

^c The ages and/or sexes of two fish, not included in the adult male and female or jack totals, were unknown.

^d Fish trapped at Kooskia were trucked and spawned at Dworshak.

^e The age and/or sex of 30 fish, not included in the male, female, or jack totals were unknown.

^f Sex ratio based on known fish.

^g 25 unsexed fish were released above the Kooskia weir to supplement natural spawning.

^h Five of these fish were spawned and released.

ⁱ Eleven of these fish were spawned and released.

^j This fish was spawned and released.

^k Seven fish were released to Frenchman Creek for natural production supplementation.

^l Includes 27 fish trucked to the Stolle Meadows reach.

^m Includes 26 fish trucked to the Stolle Meadows reach.

ⁿ Wild fish released for natural production.

Table 8. Age and sex composition of 1994 spring and summer chinook salmon returns to Idaho hatchery racks.

	MALES							FEMALES							TOTAL	MALES AND FEMALES						TOTAL	
	3 ₂		4 ₂		5 ₂		TOTAL	3 ₂		4 ₂		5 ₂		TOTAL		3 ₂		4 ₂		5 ₂			TOTAL
	No.	%	No.	%	No.	%		No.	%	No.	%	No.	%			No.	%	No.	%	No.	%		
Summer Chinook																							
McCall FH																							
CIS estimate	68	12.9	29	5.5	177	33.6	274	0	0.0	14	2.7	239	45.4	253	527	68	12.9	43	8.2	416	78.9	527	
MFH estimate	NA		NA		NA		NA	NA		NA		NA		NA	527	70	13.3	158	30.0	299	56.7	527	
HES estimate	72	13.7	31	5.9	147	27.9	250	0	0.0	13	2.5	264	50.1	277 ^a	527	72	13.7	44	8.3	411	78.0	527	
Pahsimeroi FH	9	25.0	11	30.6	0	0.0	20	0	0.0	15	41.7	1	2.8	16	36	9	25.0	26	72.2	1	2.8	36	
Spring Chinook																							
Rapid River FH	4	1.5	NA		NA		NA	0	0.0	NA		NA		NA	265	4	1.5	139	52.5	122	46.0	265	
Oxbow FH	1	3.4	NA		NA		NA	0	0.0	NA		NA		NA	29	1	3.4	9	31.0	19	65.5	29	
Dworshak NFH	2	2.8	10	13.9	21	29.2	33	0	0.0	21	29.2	18	25.0	39	72 ^b	2	2.7	31	41.9	41	55.4	74	
Kooskia NFH	1	0.5	31	15.3	57	28.2	89	0	0.0	47	23.3	66	32.7	113	202 ^c	1	0.4	96	41.4	135	58.2	232	
Clearwater FH																							
Red R-HES	0	0.0	9	29.0	9	29.0	18	0	0.0	9	29.0	4	12.9	13	31	0	0.0	18	58.1	13	41.9	31	
Crooked R-HES	0	0.0	2	7.7	6	23.1	8	1	3.8	13	50.0	4	15.4	18	26	1	3.8	15	57.7	10	38.5	26	
Powell-HES	1	1.2	10	11.6	20	23.3	31	0	0.0	18	20.9	37	43.0	55	86	1	1.2	28	32.6	57	66.3	86	
Sawtooth FH																							
CIS estimate	6	6.3	36	37.5	14	14.6	56	0	0.0	27	28.1	13	13.5	40	96	6	6.3	63	65.6	27	28.1	96	
HES estimate	6	6.3	37	38.5	13	13.5	56	0	0.0	27	28.1	13	13.5	40	96	6	6.3	64	66.7	26	27.1	96	
East Fork S.R.	0	0.0	2	13.3	9	60.0	11	0	0.0	0	0.0	4	26.7	4	15	0	0.0	2	13.3	13	86.7	15	

^a One McCall fish of unknown sex and age was arbitrarily assigned as a five-year-old female

^b Two unknown fish not in this total

^c 30 unknown fish not in this total

Table 9. Release-to-adult survival rates (SAR) for groups of brood year 1989 chinook salmon released from Idaho hatcheries. Maximum (Max.) rates typically include a small but unknown number of natural-origin returning adults.

Facility	Group	Release Number	Returns				SAR (%)
			3 ₂	4 ₂	5 ₂	Total	
McCall	MFH origin only (unmk & mk smolts)	708,600	129	1,057	393	1,579	0.2228
	Unmarked hatchery smolts	34,319	3	163	106	272	0.7926 ^a
	cwt smolts	320,510	42	433	147	622	0.1941
	otc-marked smolts	353,771	84	419	139	642	0.1815
	natural returns	NA	80	25	18	123	NA
Pahsimeroi	Max. (unmarked smolts)	227,500	6	37	1	44	0.0193
Rapid River	Max. (unmk + marked smolts)	2,564,900	96	2,546	122	2,764	0.1078
	cwt smolts	294,838	7	4	11	22	0.0075
Red River	Max. (unmk + mk smolts/presm)	460,875	5	99	13	117	0.0254
	unmarked smolts	187,075	-	-	-	-	-
	unmarked presmolts	201,501	-	-	-	-	-
	cwt presmolts	62,499	0	5	1	6	0.0096
Crooked River	Max. (unmk + marked presmolts)	339,087	13	89	10	112	0.0330
	unmarked presmolts	274,941	13	89	9	111	0.0405
	cwt presmolts	64,146	0	0	1	1	0.0016
Powell	Max. (unmk + mk smolts/presm)	487,868	6	179	57	242	0.0496
	unmarked smolts	180,764	-	-	-	-	-
	unmarked presmolts	244,757	-	-	-	-	-
	cwt presmolts	62,347	0	3	4	7	0.0112
Dworshak	Max. (unmk + marked smolts)	1,094,884	23	452	41	516	0.0471
	unmarked smolts	404,571	20	285	21	326 ^b	0.0806
	all cwt smolts	679,063	3	167	20	190	0.0280
	high BKD cwt smolts	75,480	0	6	1	7	0.0093
	low BKD cwt smolts	114,551	0	16	3	19	0.0166
	low density cwt smolts	145,418	0	55	8	63	0.0433
	medium density cwt smolts	196,880	1	52	3	56	0.0284
	high density cwt smolts	146,734	2	38	5	45	0.0307
Kooskia	Max. (all unmk smolts)	396,619	14	749	135	898	0.2264
Sawtooth	Max. (all unmk + marked smolts)	650,600	26	77	26	129	0.0198
	all cwt smolts	378,017	2	15	6	23	0.0061
East Fork	Max. (unmarked + marked smolts)	98,300	15	19	13	47	0.0478

^a probably includes some natural fish.

^b includes three fish without CWTs and age

Table 10. Female progeny: parent ratios (adult to adult survival) and hatchery production statistics for brood year 1989 spring and summer chinook salmon. Numbers of males and females returned include some natural-origin fish unless otherwise noted.

Facility	Female used/ (spawned)	Male used/ (spawned)	Green eggs taken	Fry produced	Smolts released	Smolt equivalents	Females returned	Males returned	Progeny: parent ^h
Summer Chinook									
McCall	178 (151)	221 (67)	801,319	729,845	708,600	708,600	803	880 ^a	4.51
Spring Chinook									
Clearwater									
Red R.					460,875 ^b	447,185	55	62 ^c	na
	35 (31)	33 (na)	136,400	na	104,545	104,545	10	12 ^d	0.29
Crooked R	0	0							
Powell	0	0							
Dworshak	na 394 (950)	na 332 (800)	3,516,306	na	1,094,884 ^e	2,637,230 ^f	244	269	0.62
Kooskia									
Sawtooth	141 (137)	275 (139)	747,500	na	650,600	650,600	46	83	0.33
East Fork	20 (20)	39 (22)	118,400	na	98,300	98,300	10	36	0.50

^a Natural returns accounted for only in the 1994 returns (15 females, 2 males of natural origin)

^b Includes DNFH & KNFH (187,075 smolts) + 273,800 presmolts (some of unknown origin) x .95 (presmolt-smolt survival) = 104,545 smolt equivalents.

^c Returns from all smolts and presmolts released

^d Estimated based on proportion of smolt (equivalents) released

^e Only smolts released to North Fork Clearwater River

^f Assume 75% green egg to smolt survival and back calculate number of females needed to produce smolts released are North Fork Clearwater. (950 females/(3,516,306 x .75) (1,094,884)

^g 452 four-year-olds returned in 1993. Equal numbers of males and females assumed.

^h Females returned ÷ females used

Table 11. Snake River mean daily flow (kcfs) at Lower Granite Dam during the "peak" and "extended" chinook salmon smolt migration periods, 1977-1995. The migration periods are as defined by Petrosky (1991).

Year	"Peak" (04/15-05/05)	"Extended" (04/20-05/30)
1977	39.1	40.2
1978	85.4	95.8
1979	64.8	89.9
1980	87.5	102.9
1981	76.2	86.7
1982	116.8	131.6
1983	85.6	111.3
1984	121.9	146.1
1985	86.9	87.2
1986	93.4	105.7
1987	59	62.4
1988	55.1	64.2
1989	93.6	87.2
1990	63.8	66.4
1991	44	70.5
1992	54.2	57.3
1993	69.8	114
1994	64.1	77.5
1995	72.9	74.1

Table 12. Median travel times (days) and detections rates (percent) for PIT-tagged spring and summer chinook salmon juveniles released from Idaho hatcheries and emigrating in 1994. Median travel times represent detections at only Lower Granite Dam. Detections rates represent total cumulative unique detections at Lower Granite, Little Goose, Lower Monumental, and McNary dams. McCall Fish Hatchery treatment groups represent the time-at-release study. Pahsimeroi and Rapid River hatcheries are funded by the Idaho Power Company; all other chinook salmon programs are operated under the Lower Snake River Compensation Plan.

Run / Hatchery / Release Group	Release Date	Median Travel Time (days)	Detection Rate (%) For All Detections
SUMMER CHINOOK			
McCall Fish Hatchery			
General Production	4/9/94	32	35.7
Treatment 1	4/12/94	29	39.0
Control 1	4/14/94	29	33.5
Treatment 2	4/22/94	27	25.0
Control 2	4/28/94	23	26.3
Pahsimeroi Fish Hatchery			
Pond 1	4/9-14/94	19	24
Pond 2	4/9-14/94	22	21
SPRING CHINOOK SALMON			
Sawtooth Fish Hatchery			
Natural Rearing Treatment	4/8-9/94	26	15.6
Natural Rearing Control	4/8-9/94	25	15.0
Supplementation	4/9/94	27	13.0
High-BKD	4/11/94	24	15.6
East Fork Salmon River	4/8/94	27	12.9
Clearwater Fish Hatchery			
Powell Satellite			
Acclimated, Natural Reared	4/13/94	27	46.8
Acclimated, Control	4/13/94	26	58.0
Non-acclimated, Natural Reared	4/13/94	22	50.4
Non-acclimated, Control	4/13/94	22	52.0
High BKD	4/14/94	25	38.0
Papoose Creek			
Supplementation, Low-BKD	4/15/94	24	43.8
Upper Lochsa River Tributaries			
White Sands Creek	8/4/93	na	5.5
Big Flat Creek	8/5/93	na	5.6
Squaw Creek	8/5/93	na	2.4
Pete King Creek	8/6/93	na	10.2
Red River	10/12/93	na	6.8

Table 12. (Continued.)

Run / Hatchery / Release Group	Release Date	Median Travel Time (days)	Detection Rate (%) For All Detections
Crooked River			
Volitional #1	4/9/94	17	52.7
Volitional #2	4/10/94	20	28.0
Volitional #3	4/11/94	20	20.0
Volitional #4	4/12/94	26	25.0
Volitional #5	4/13/94	28	17.0
Forced #1	4/15/94	21	45.3
Forced #2	4/16/94	20	43.3
Forced #3	4/18/94	21	25.0
Forced #4	4/19/94	21	27.0
Rapid River Fish Hatchery			
Rapid River - H	4/12/94	21	37.0
Rapid River - A	4/21/94	18	31.0
Hells Canyon Dam	4/20-21/94	20	30.0

Table 13. Chinook salmon run year 1994 compensation accounting for Lower Snake River Compensation facilities operated in Idaho.

	Adult Return			Juvenile Releases ^a				
	Goal	1994		Annual Target	Brood Year Releases Contributing to 1994 Return			
		Actual	% of Goal		1989	1990	1991	% of Target ^b
Summer Chinook								
McCall Fish Hatchery	8,000	527	6.6%	1,000,000	708,600	901,500	607,288	74%
Spring Chinook								
Sawtooth Fish Hatchery	19,445	111	0.6%	2,300,000	748,900	1,340,478	809,751	42%
Clearwater Anadromous	11,915	143	1.2%	1,369,500	1,195,652	1,351,911	220,589	67%
Dworshak National	9,135	74	0.8%	1,400,000	1,097,956	959,369	467,222	60%
Total	48,495 ^c	855	1.8%	6,069,500	3,751,108	4,553,258	2,104,850	57%

^a Release numbers are smolt equivalents. Parr and presmolt releases were converted to smolt equivalents by multiplying by 0.75 and 0.90, respectively.

^b (1989 release + 1990 release + 1991 release) (annual target * 3) *100

^c Actual goal = 48,560. Difference due to rounding errors and conversion of hatchery juvenile production capacities to adult returns.

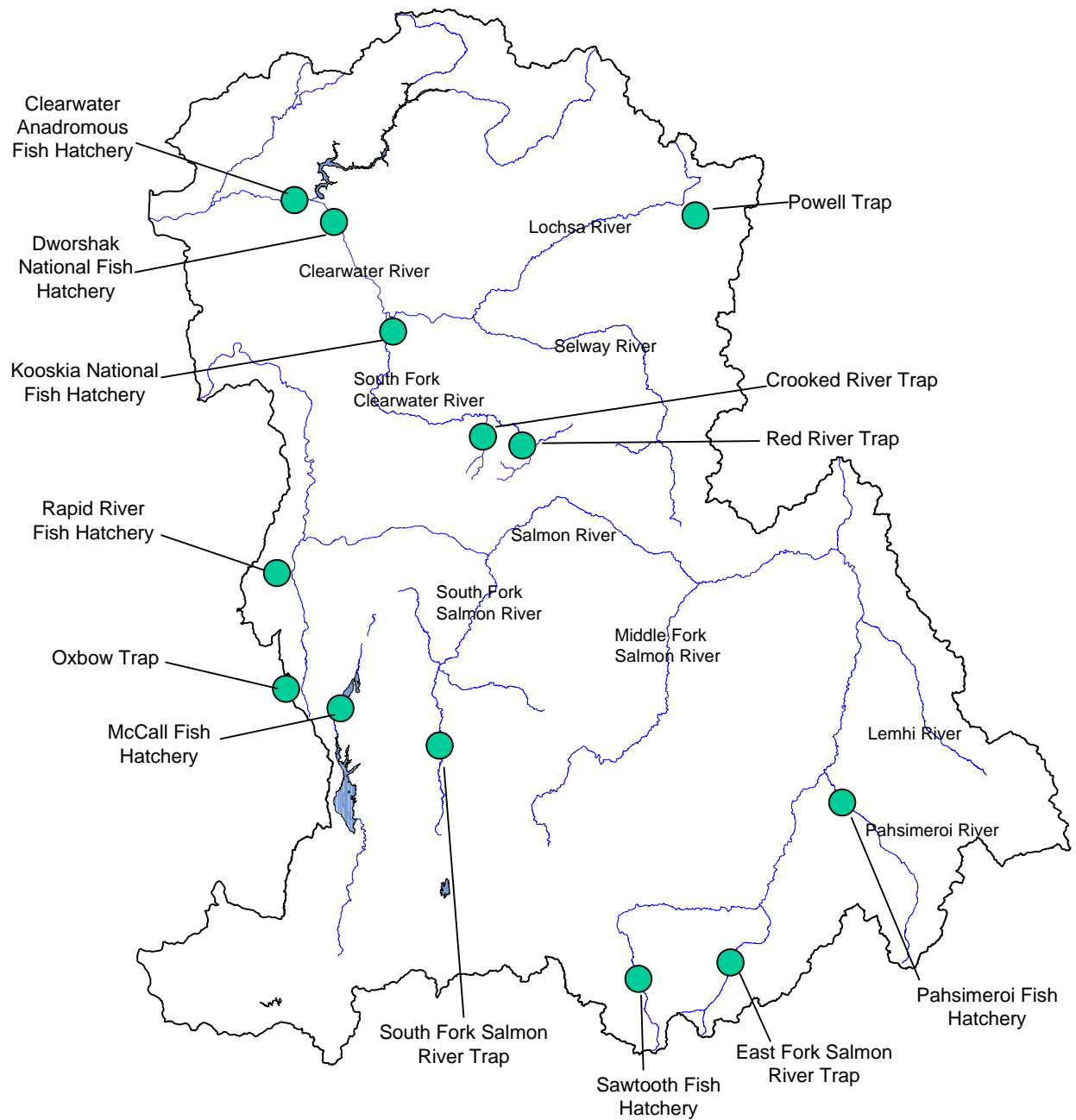


Figure 1. Locations of chinook salmon hatcheries and trapping facilities in Idaho.

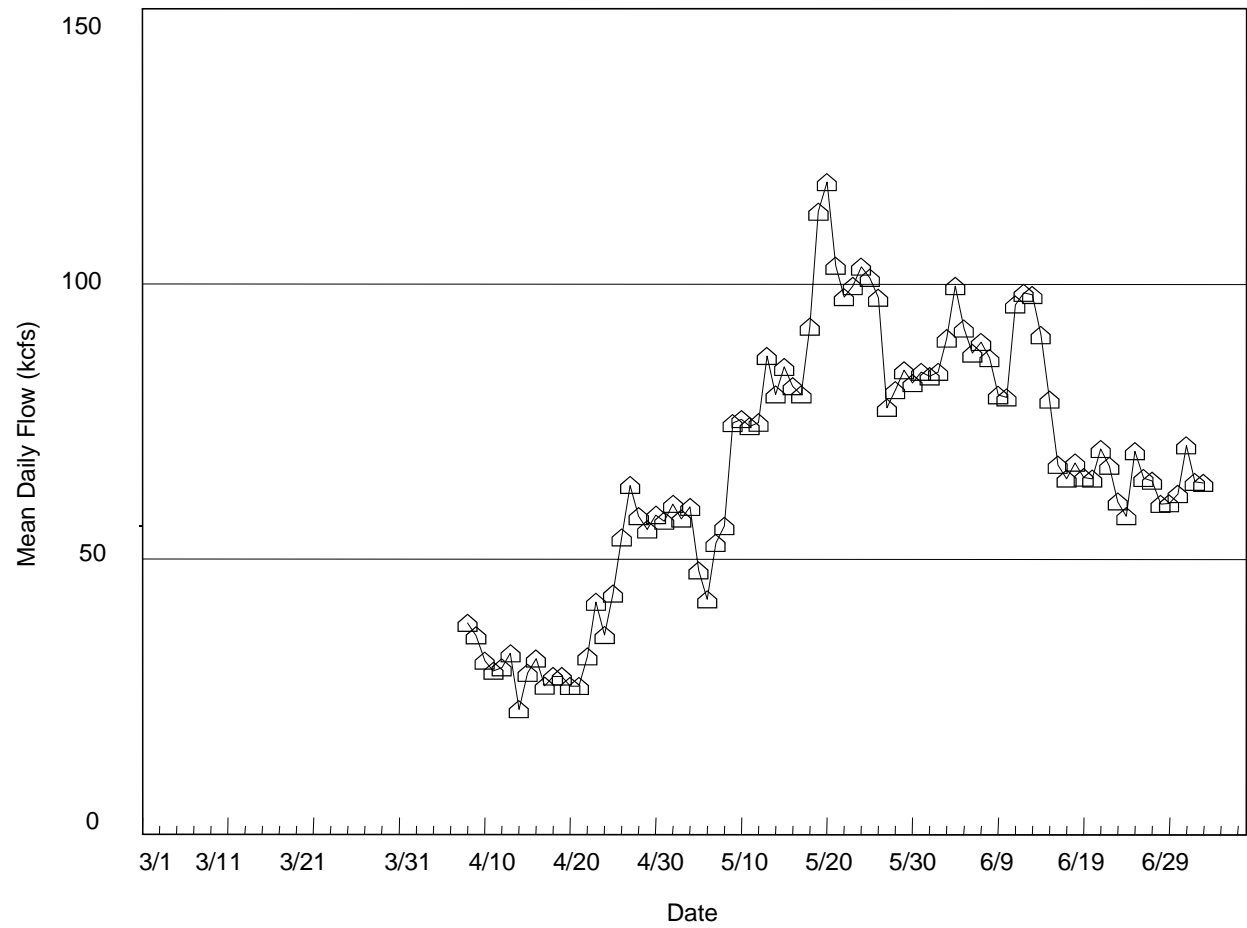


Figure 2. Daily flows (kcfs) measured at Lower Granite Dam during the 1991 smolt emigration period. Flow data were obtained from the Fish Passage Center, Portland, Oregon.

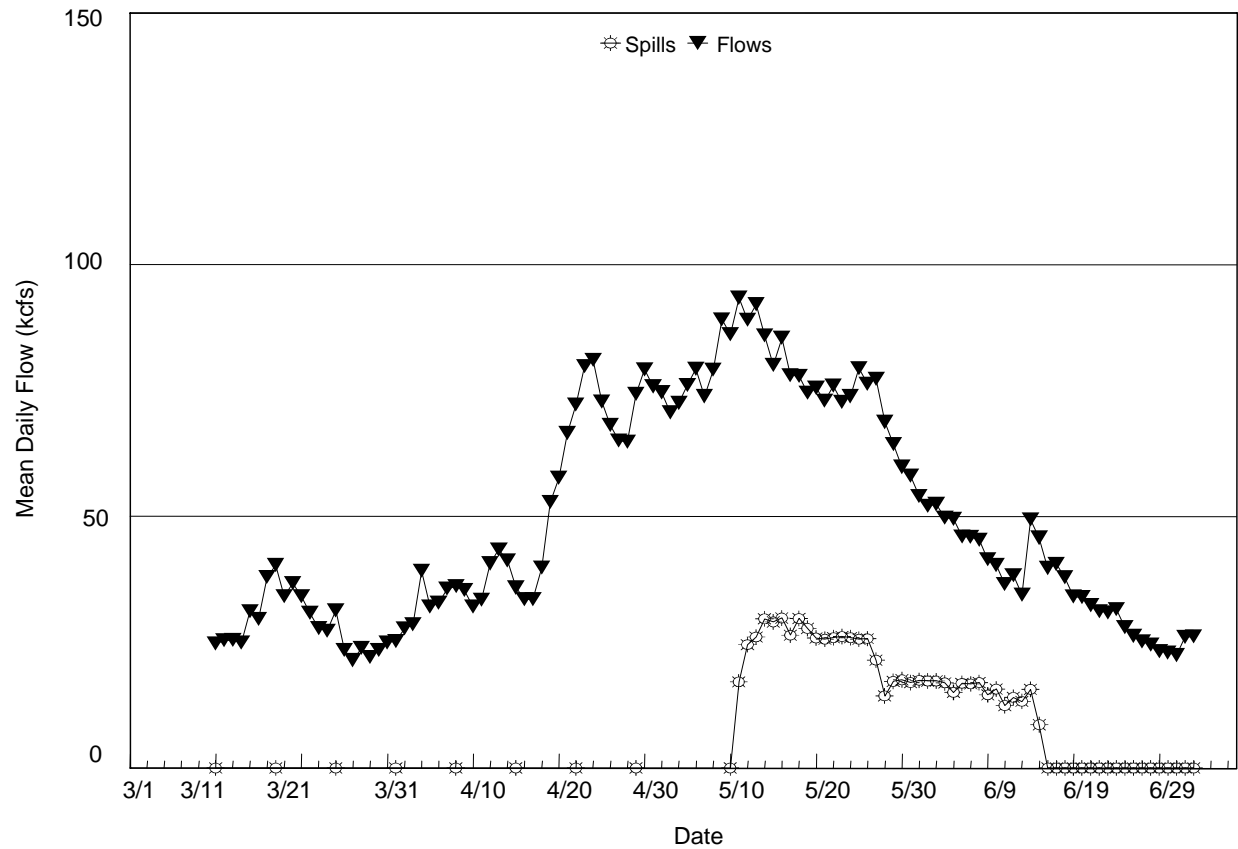


Figure 3. Daily flows and spill (kcfs) measured at Lower Granite Dam during the 1994 smolt emigration period. Flow and spill data were obtained from the Fish Passage Center, Portland, Oregon.

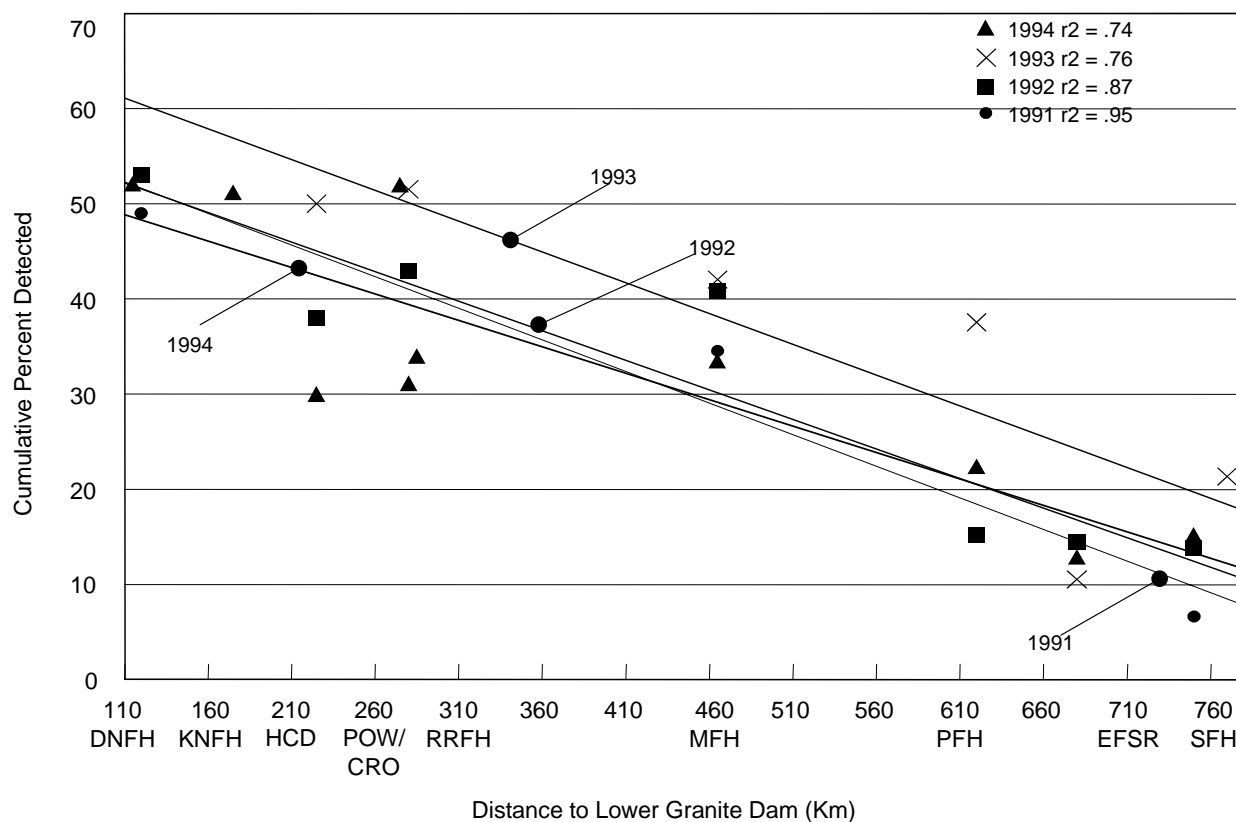


Figure 4. Detection rates versus distance (km) of release from Lower Granite Dam for PIT-tagged spring and summer chinook salmon released from Idaho hatcheries, 1991-1994. DNFH = Dworshak National Fish Hatchery, KNFH = Kooskia NFH, HCD = Hells Canyon Dam (smolts produced at Rapid River FH), POW = Powell Satellite, CRO = Crooked River Satellite, RRFH = Rapid River FH, MFH = McCall FH, PFH = Pahsimeroi FH, EFSR = East Fork Salmon River Satellite, SFH = Sawtooth FH. McCall and Pahsimeroi hatcheries produce summer chinook salmon; all others produce spring chinook salmon.

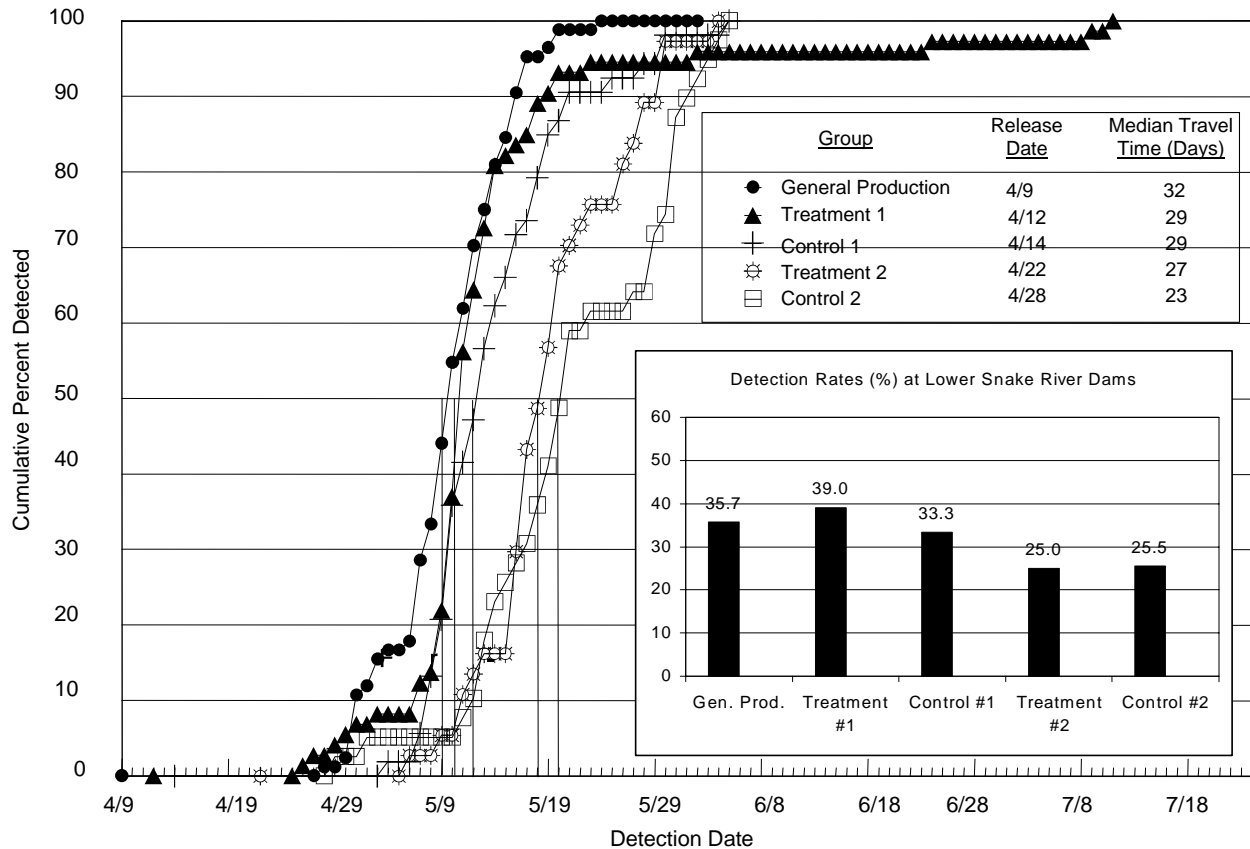


Figure 5. Migration year 1994 arrival timing and detection rates for PIT-tagged McCall Fish Hatchery juvenile summer chinook salmon released near Knox Bridge on the South Fork Salmon River, Idaho. Four PIT-tagged groups (two controls and two treatments) were released for a time of release study. Vertical lines indicate median arrival dates. Detection rates represent cumulative unique detections at Lower Granite, Little Goose, Lower Monumental, and McNary dams. Travel times and arrival dates are based on PIT-tag detections at only Lower Granite Dam.

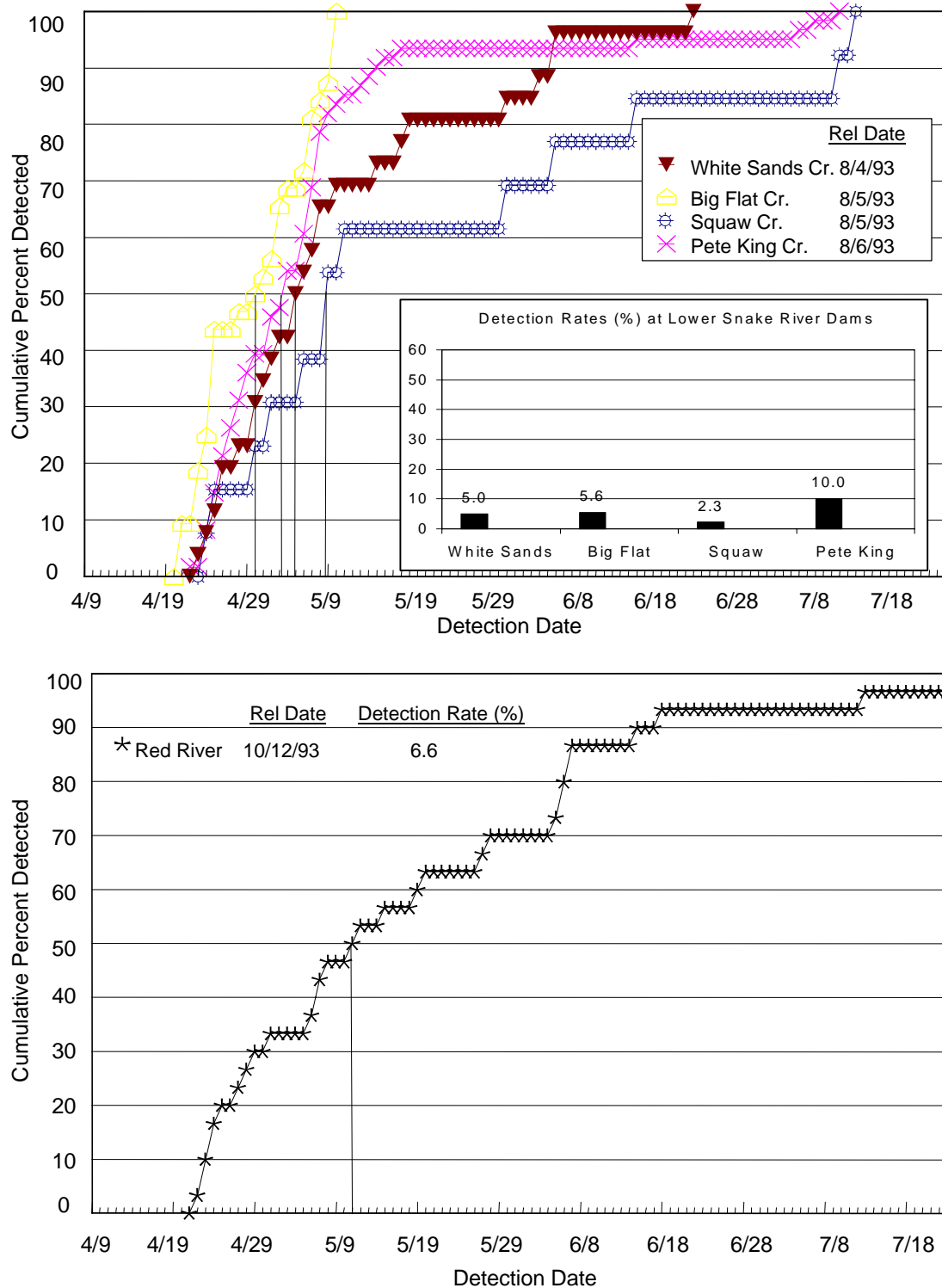


Figure 6. Migration year 1994 arrival timing and detection rates for PIT-tagged Clearwater Fish Hatchery juvenile spring chinook salmon released in four Lochsa River tributaries (upper) and as presmolts in Red River (lower). All releases were made for Idaho Supplementation Studies evaluations. Vertical lines indicate median

arrival dates. Detection rates represent cumulative unique detections at Lower Granite, Little Goose, Lower Monumental, and McNary dams.

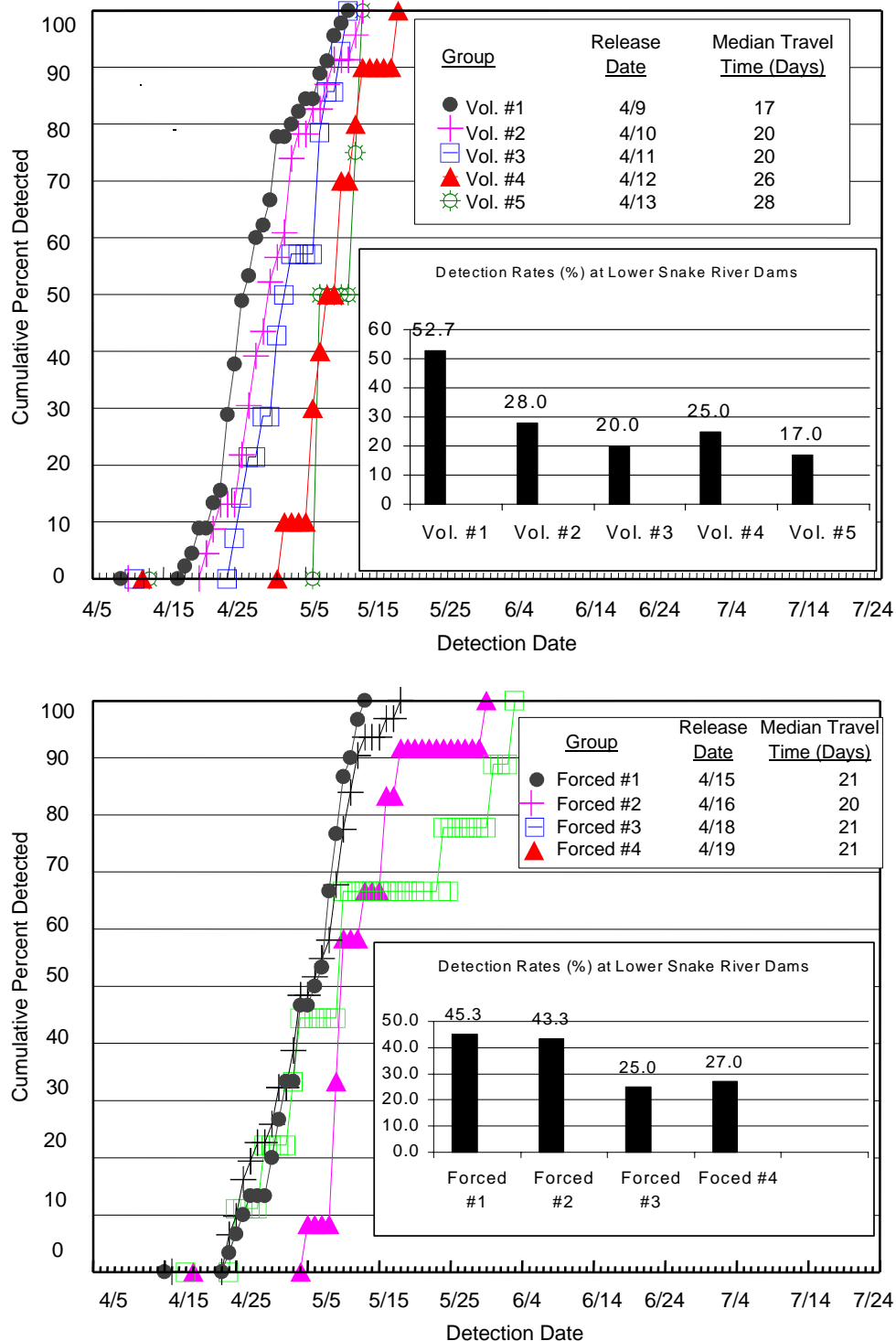


Figure 7. Migration year 1994 arrival timing and detection rates for PIT-tagged Clearwater Fish hatchery juvenile spring chinook salmon released into Crooked River (South Fork Clearwater River tributary). Fish were released volitionally (Vol.) from April 9-13, 1994 (upper). Remaining fish were forced (Forced) from the holding facilities

from April 15-19, 1994 (lower). Travel times and arrival dates are based on PIT-tag detections at only Lower Granite Dam.

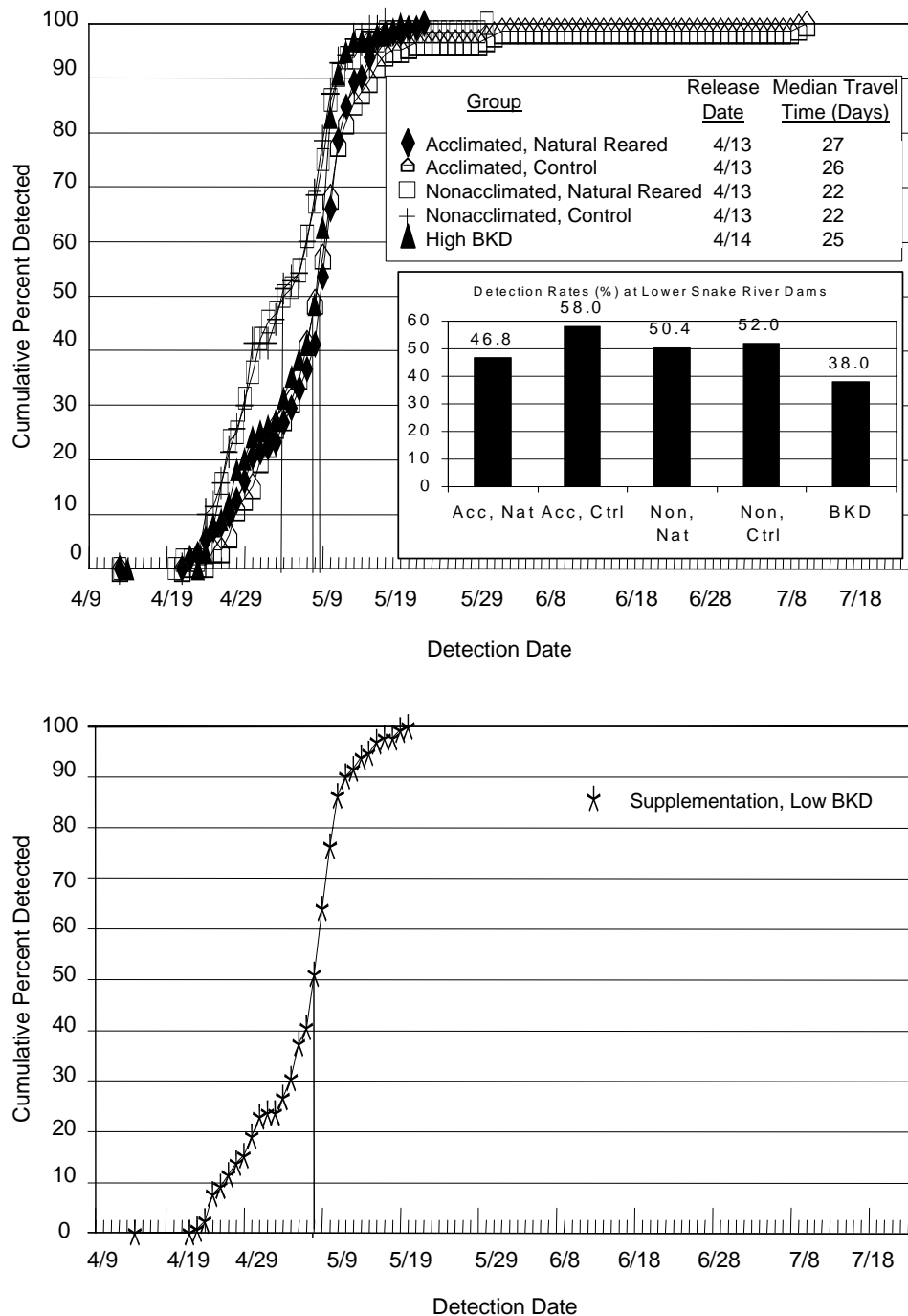


Figure 8. Migration year 1994 arrival timing for PIT-tagged Clearwater Anadromous Fish Hatchery juvenile spring chinook salmon release at the Powell satellite (upper) and at Papoose Creek (lower). Naturally-reared fish were provided with overhead cover and camouflaged (painted) raceways at Clearwater Anadromous Fish Hatchery. High BKD smolts were derived from high BKD females. The Papoose Creek release was made for Idaho Supplementation Studies evaluations. Vertical lines indicated median arrival dates. Detection rates represent cumulative unique detections at Lower Granite, Little Goose, Lower Monumental, and McNary dams.

Travel times and arrival dates are based on PIT-tag detections at only Lower Granite Dam.

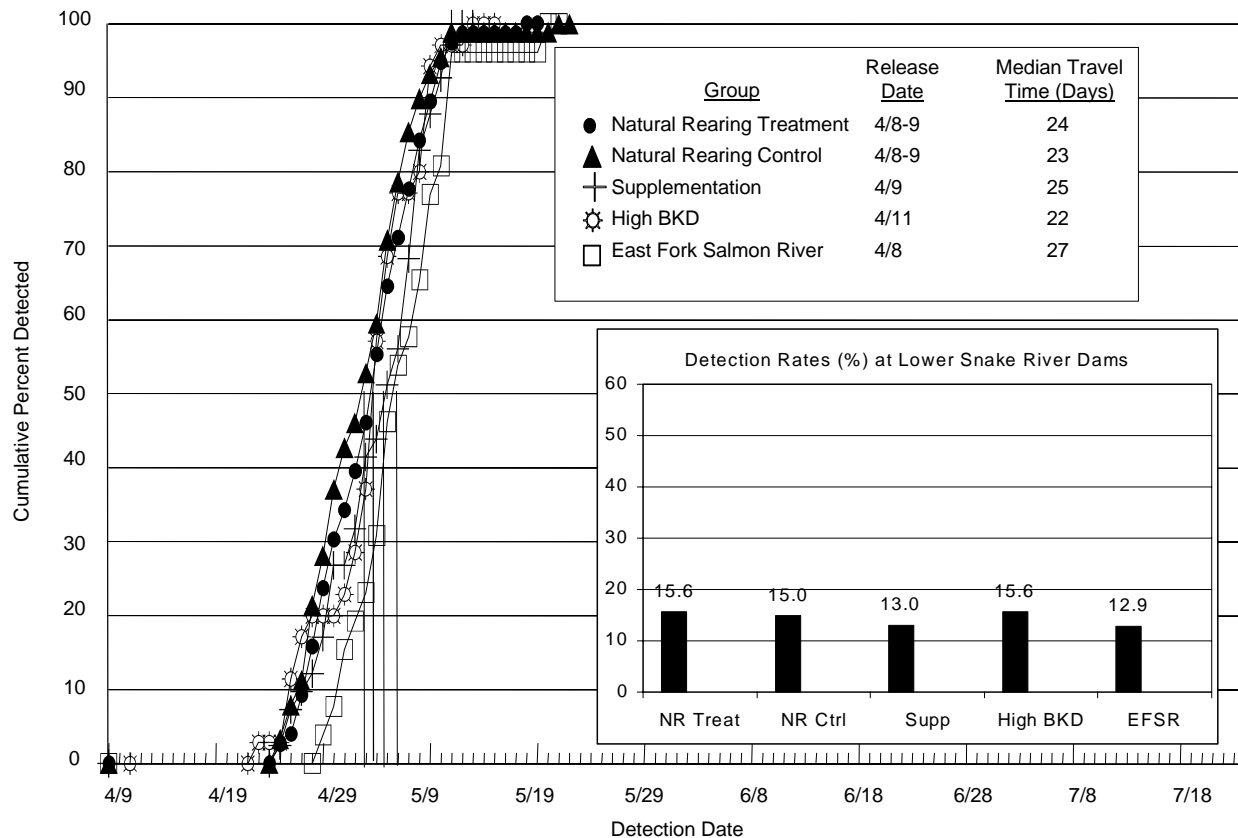


Figure 9. Migration year 1994 arrival timing and detection rates for PIT-tagged Sawtooth Fish Hatchery juvenile spring chinook salmon released in the Salmon River and the East Fork Salmon River. Treatment and control groups were part of a natural rearing study. Supplementation fish were released for Idaho Supplementation Studies evaluations. High BKD smolts were derived from high BKD females. Vertical lines indicated median arrival dates. Detection rates represent cumulative unique detections at Lower Granite, Little Goose, Lower Monumental, and McNary dams. Travel times and arrival dates are based on PIT-tag detections at only Lower Granite Dam.

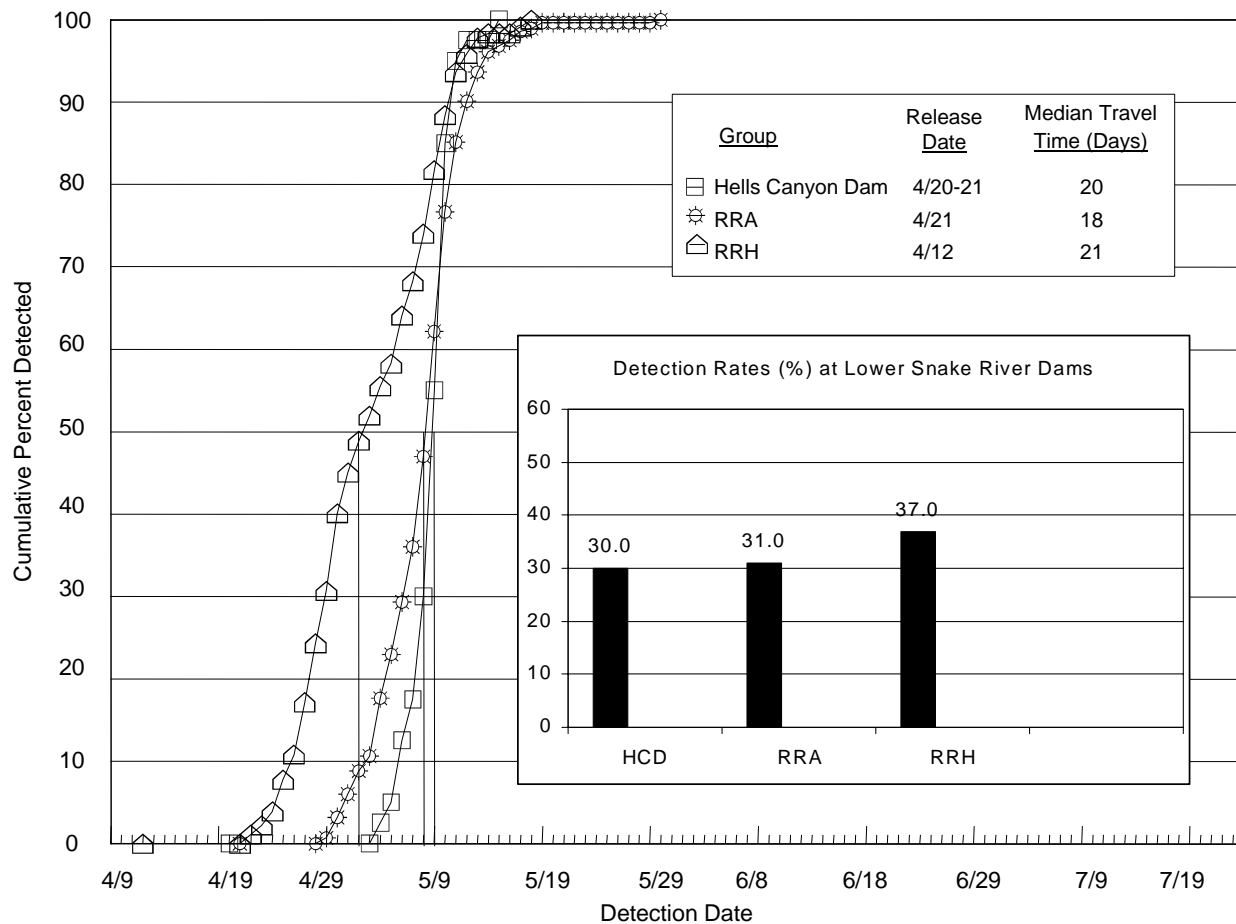


Figure 10. Migration year 1994 arrival timing and detection rates for PIT-tagged Rapid River Fish Hatchery juvenile spring chinook salmon released in Rapid River at the hatchery (RRA and RRH) and into the Snake River below Hells Canyon Dam. Vertical lines indicated median arrival dates. Detection rates represent cumulative unique detections at Lower Granite, Little Goose, Lower Monumental, and McNary dams. Travel times and arrival dates are based on PIT-tag detections at only Lower Granite Dam.

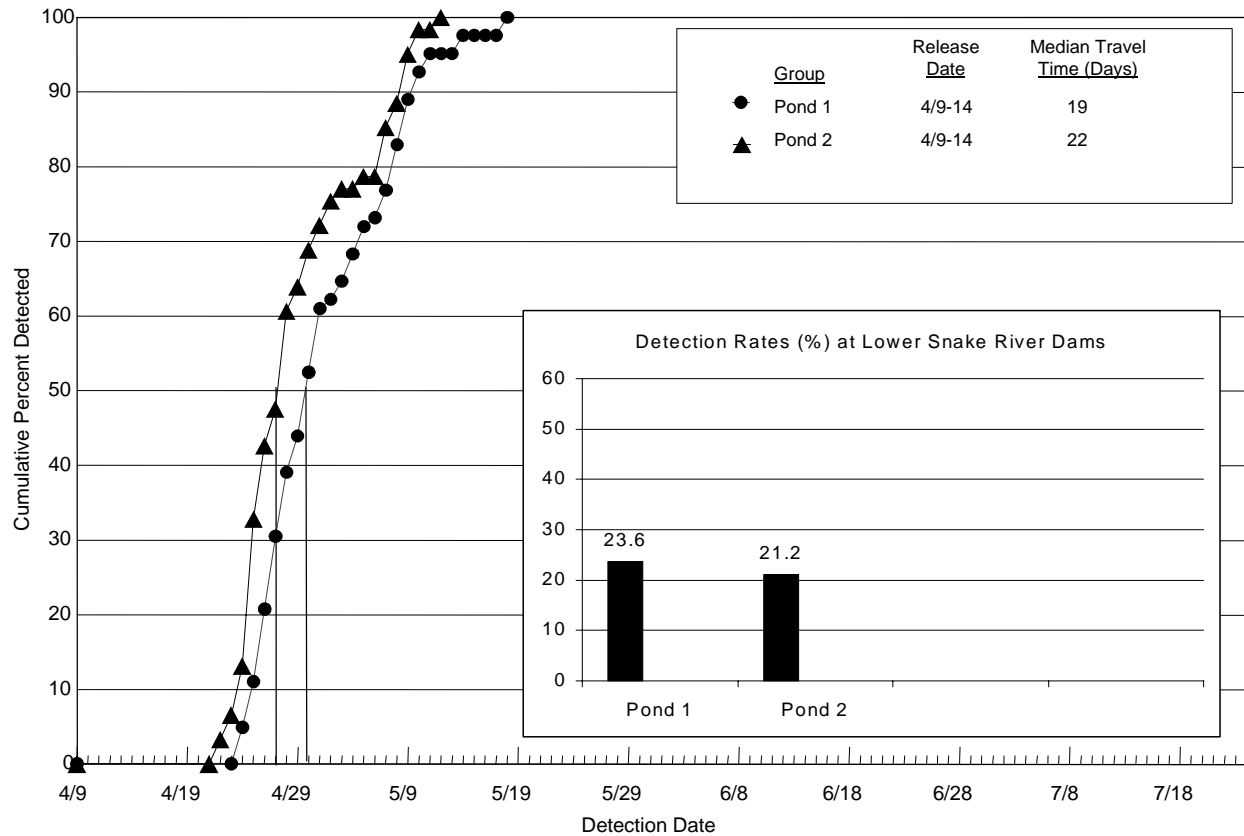


Figure 11. Migration year 1994 arrival timing and detection rates for PIT-tagged Pahsimeroi Fish Hatchery juvenile summer chinook salmon released in the Pahsimeroi River at the hatchery. Vertical lines indicate median arrival dates. Detection rates represent cumulative unique detections at Lower Granite, Little Goose, Lower Monumental, and McNary dams. Travel times and arrival dates are based on PIT-tag detections at only Lower Granite Dam.

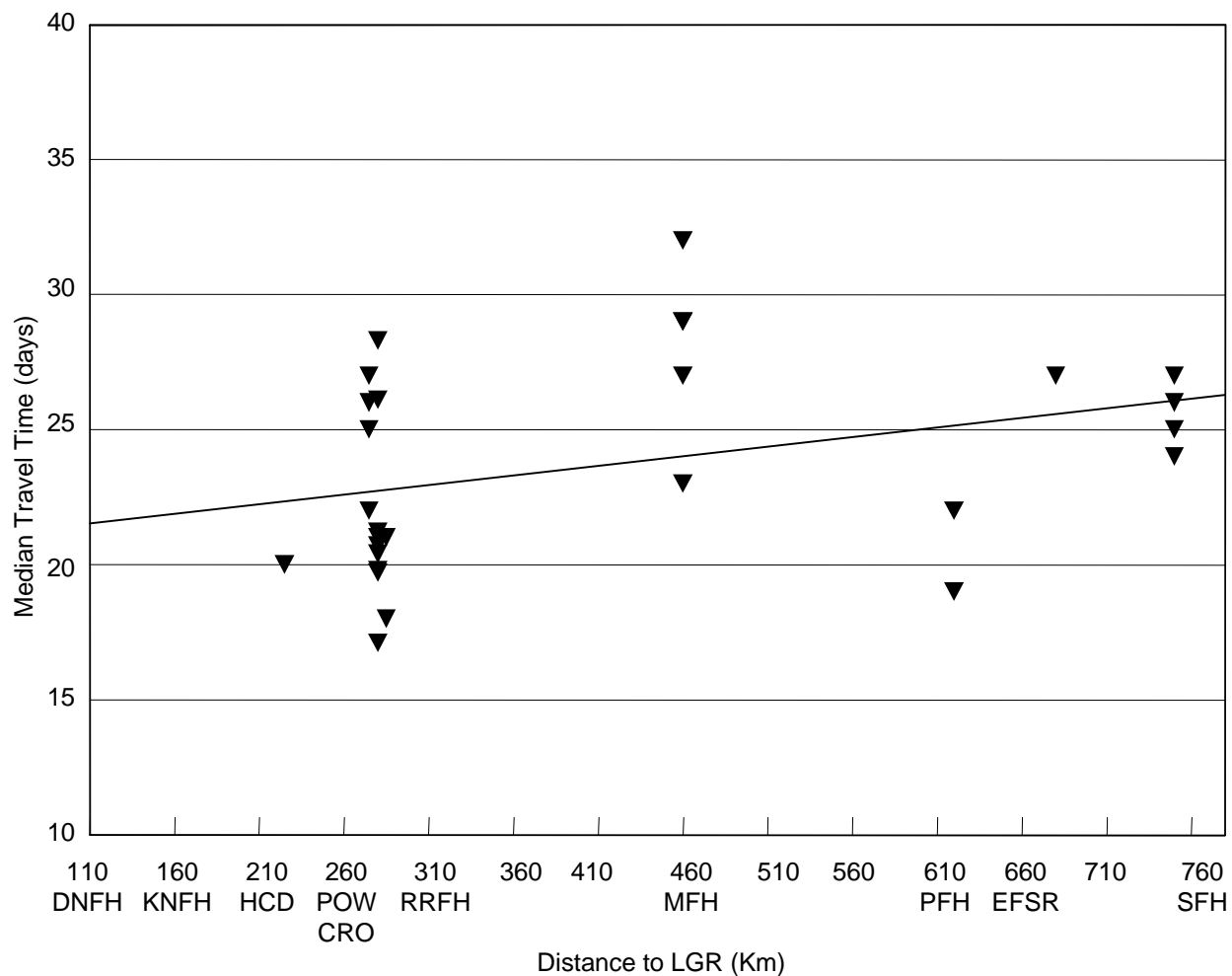


Figure 12. Median travel time (days) to Lower Granite Dam versus migration distance (km) to Lower Granite Dam for PIT-tagged spring and summer chinook salmon smolts released from Idaho hatcheries that emigrated in 1994 ($r^2=0.126$). Median travel times are based on unique PIT-tag detections at Lower Granite Dam. DNFH = Dworshak National Fish Hatchery, KNFH = Kooskia NFH, HCD = Hells Canyon Dam (smolts produced at Rapid River FH), POW = Powell Satellite, CRO = Crooked River Satellite, RRFH = Rapid River FH, MFH = McCall FH, PFH = Pahsimeroi FH, EFSR = East Fork Salmon River Satellite, SFH = Sawtooth FH. McCall and Pahsimeroi hatcheries produce summer chinook. All others are spring chinook.

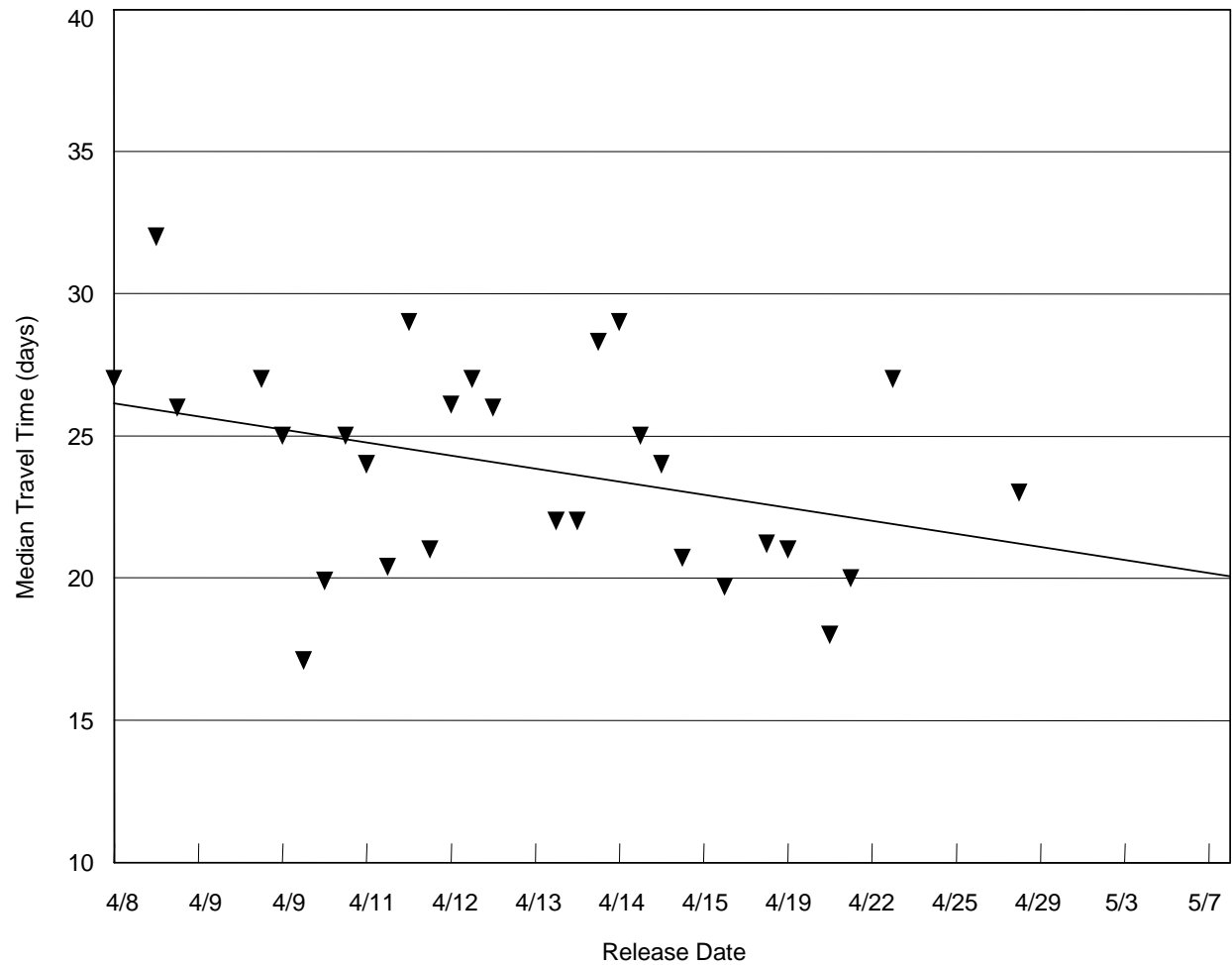


Figure 13. Median travel time (days) to Lower Granite Dam versus release date for PIT-tagged spring and summer chinook salmon smolts released from Idaho hatcheries that emigrated in 1994 ($r^2=0.123$). Median travel times are based on unique PIT-tag detections at only Lower Granite Dam.

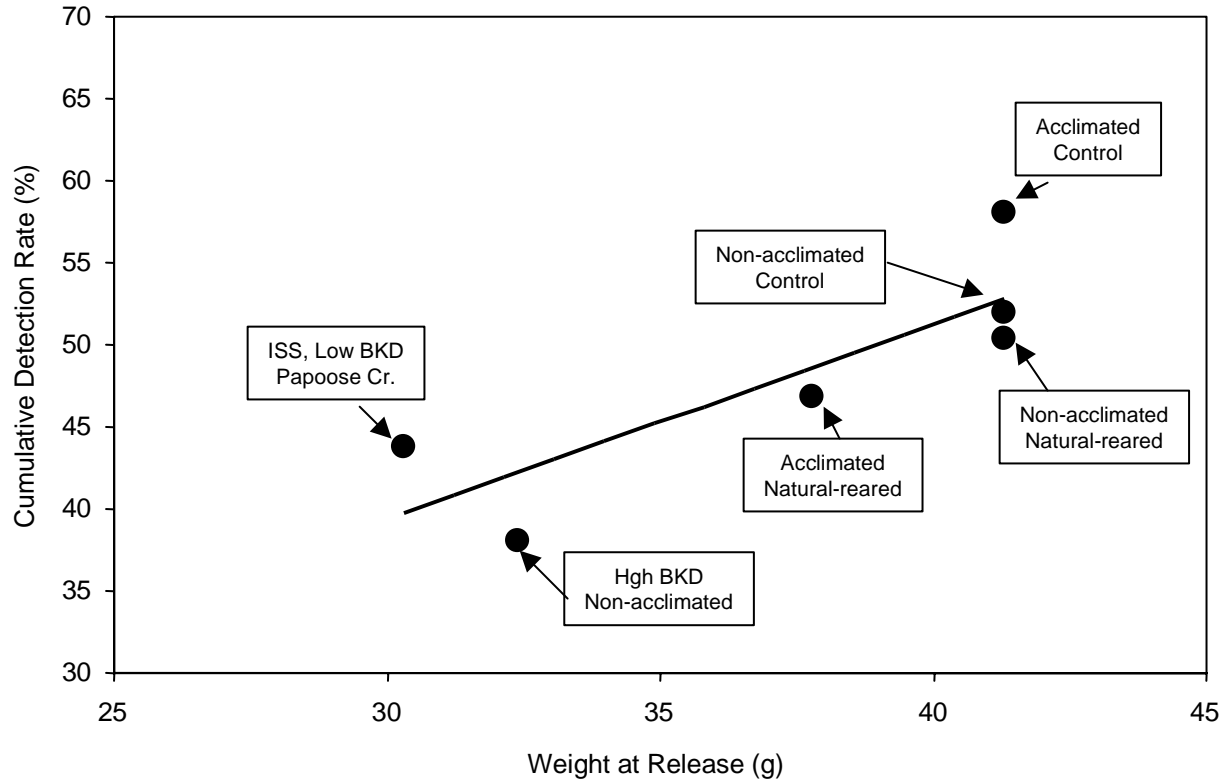


Figure 14. PIT-tag detection rate versus fish size at release for five groups of spring chinook salmon smolts released at the Clearwater Anadromous Fish Hatchery Powell satellite facility and Papoose Creek in 1994. Trend line fitted by regression analysis ($r^2=0.70$).

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APPENDICES

Appendix A. Table 1. Release and return data for McCall Fish Hatchery summer chinook salmon brood years 1989-1992.

Release Site/Date	Rcwy No.	Stock ID	Identifying Marks			Total #		Returns					Marking Purpose	
			Type	Code	Number	Rel./Rcwy	FPP	1-Oc	2-Oc	3-Oc	Total	Percent		
Hatchery: McCall		Brood Year: 1989												
Knox Br./SFSR														
3/18-21/91	2	SFSR		None	34,319	354,829	23.9						Production	
			CWT/Ad	103431	21,502			3	33	9 ^a	45	0.2093	Eval. & Cont., Marking: Test	
			CWT/Ad	103432	21,810			2	23	8	33	0.1513	"	
			CWT/Ad	103433	20,700			1	35	8	44	0.2126	"	
			CWT/Ad	103434	20,807			2	25	8	35	0.1682	"	
			CWT/Ad	103435	21,463			0	25	17 ^b	42	0.1957	"	
			w/RD->0-1	103435	(20,122)								"/FPC	
			CWT/Ad	103436	22,608			2	28	8 ^a	38	0.1681	"	
			w/RA->0-1	103436	(22,261)								"/FPC	
			w/LA->0-1	103436	(347)								"/FPC	
			CWT/Ad	103437	21,620			2	29	13	44	0.2035	Eval. & Cont., Marking: Test	
			CWT/Ad	103438	21,331			6	12	5	23	0.1078	"	
			CWT/Ad	103439	21,253			4	32	13	49	0.2306	"	
			CWT/Ad	103440	21,443			3	26	15 ^a	44	0.2052	"	
			CWT/Ad	103441	21,501			3	27	9 ^a	39	0.1814	"	
			CWT/Ad	103442	21,406			1	22	8	31	0.1448	"	
			CWT/Ad	103443	21,527			2	23	10 ^{a,c}	35	0.1626	"	
			w/PIT	103443	(200)			0	0	0	0	0.0000	Migration Surv. & Timing: Test	
			CWT/Ad	103444	21,442			3	29	9	41	0.1912	Eval. & Cont., Marking: Test	
			CWT/Ad	103445	19,387			4	30	8	42	0.2166	"	
			w/LA->0-1	103445	(20,097)								"/FPC	
			LA->0-1		710								(CWT/FB fish which shed tags)	
3/18-21/91	1	SFSR	TM-100(otc)		353,771	353,771	23.9	88	457	137	682	0.1928	Eval. & Cont., Marking: Control	
			w/PIT		(200)			0	0	1	1	0.5000	Migration Surv. & Timing: Ctrl	
			Total CWT/Ad		319,800			CWT Total	38	399	148	585	0.1829	
								No Tags	0	42	6	48		
								Ad CWT total	38	441	154	633	0.1979	
			Total OTC		353,771			OTC total	88	457	137	682	0.1928	
			LA->0-1		710									
			None		34,319									
			Total		708,600									

Appendix A. Table 1. (Continued.)

Appendix A: Table 1: (Continued.)

Release Site/Date	Rcwy No.	Stock ID	Identifying Marks			Total #		Returns					Marking Purpose
			Type	Code	Number	Rel./Rcwy	FPP	1-Oc	2-Oc	3-Oc	Total	Percent	
Hatchery: McCall		Brood Year: 1990											
Knox Br./SFSR													
3/24-27/92	2	SFSR		None	17,260	450,750	23.8						Production
			CWT/Ad	103446	21,427			0	0		0	0.0000	Eval. & Cont., Marking: Test
			CWT/Ad	103447	21,353			0	0		0	0.0000	
			CWT/Ad	103448	20,807			0	1		1	0.0048	
			w/RA-7U-1	103448	(21724)								Freeze Brands - FPC
			CWT/Ad	103449	21,229			0	1		1	0.0047	Eval. & Cont., Marking: Test
			w/PIT	103449	(250)			0	0		0	0.0000	Migration Surv. & Timing: Test
			CWT/Ad	103450	21,397			0	0		0	0.0000	Eval. & Cont., Marking: Test
			w/LD-7U-1	103450	(21,397)								Freeze Brands - FPC
			CWT/Ad	103451	20,520			1	0		1	0.0049	Eval. & Cont., Marking: Test
			w/RA-7U-3	103451	(20,520)								Freeze Brands - FPC
			CWT/Ad	103452	21,253			0	0		0	0.0000	Eval. & Cont., Marking: Test
			CWT/Ad	103453	21,558			0	0		0	0.0000	"
			CWT/Ad	103454	22,003			0	0		0	0.0000	"
			CWT/Ad	103455	21,997			0	0		0	0.0000	"
			CWT/Ad	103456	21,973			0	0		0	0.0000	"
			CWT/Ad	103457	21,430			0	3		3	0.0140	"
			w/PIT	103458	21,302			1	0		1		"
			CWT/Ad	103459	21,694			0	1		1	0.0046	"
			CWT/Ad	103460	22,150			0	0		0	0.0000	"
			RV		111,397			0	0		0	0.0000	Stock Recognition / ISS
3/24-27/92	1	SFSR	TM-100(otc)		450,750	450,750	23.8	26	37				Eval. & Cont., Marking: Control
			w/PIT		(250)			0	0		0	0.0000	Migr. Surv. & Timing: Ctrl / LSRCP
			Tot CWT/Ad (all)		322,093		CWT Total	2	6		8	0.0025	
			Total OTC		450,750		No Tags						
			RV		111,397		Ad CWT total	2	7		9	0.0028	
			None		17,260		OTC Total	26	37		63	0.0140	
			Total release		901,500								

Appendix A. Table 1. (Continued.)

Appendix A: Table 1: (Continued.)

Release Site/Date	Rcwy No.	Stock ID	Identifying Marks			Total #		Returns					Marking Purpose
			Type	Code	Number	Rel./Rcwy	FPP	1-Oc	2-Oc	3-Oc	Total	Percent	
Hatchery: McCall		Brood Year: 1991											
Knox Br./SFSR													
4/3-4/93	1	SFSR	CWT/Ad/OTC	103602	304,567	312,788	19.2	27			27	0.0089	Eval. & Cont., OTC Check.
4/9/93			w/PIT	103602	504			0			0	0.0000	Time of Release #1
4/22/93			w/PIT	103602	500			0			0	0.0000	Time of Release #2
5/5/93			w/PIT	103602	499			0			0	0.0000	Time of Release #3
4/3-4/93			w/PIT	103602	3,000			1			1	0.0333	FPC Studies
			Ad clip		3,718								(CWT Fish which shed tags)
4/21-22/93	2	SFSR	CWT/Ad	103225	52,368	294,500	17.0	4			4	0.0076	Supplementation, Mag. off
			CWT/Ad	103226	52,976			7			7	0.0132	Eval. & Cont.
			CWT/Ad	103227	54,464			4			4	0.0073	Eval. & Cont.
			Ad clip		4,942								(CWT Fish which shed tags)
			RV clip		129,250			10			10	0.0077	Supplementation
4/3-4/93			RV/PIT		500			0			0	0.0000	Supplementation
			Total CWT/Ad		468,878		CWT Total	43			43	0.0092	
			Ad clip		8,660		No Tags	16			16		
			RV clip		129,250		Ad CWT total	59			59	0.0126	
			RV/PIT		500								
			Total release		607,288								
Hatchery: McCall		Brood Year: 1992											
Knox Br./SFSR													
0.261702128	1	SFSR	CWT/AD	104902	317,775	538,853							U.S. Canada / eval shed tags
			AD clip		9,828								
			CWT/AD/PIT	104902	-792								Time of Release Experiment
			or AD/PIT		-808								Time of Release Experiment
			CWT/AD/PIT	104902									
			or AD/PIT		(1500)								Hand vs. Auto inject/FPC
			CWT/AD/PIT	104902									
			or AD/PIT		(1500)								Hand vs. Auto inject/FPC
			AD clip		212,850								Identification
0.338061466	2	SFSR	AD clip		283,771	519,710							Identification
			LV clip		235,441								Identification / Supplementation
			LV/PIT		498								Identification / Supplementation
			CWT/AD (incl pit)		317,775								
			Ad clip		506,449								
			LV clip		235,441								
			LV/PIT		498								
			CWT/AD/PIT										
			or AD/PIT		(4600)								
			Total release		1,060,163								

Appendix A. Table 1. (Continued.)

Appendix A: Table 1: (Continued.)

Release Site/Date	Rcwy No.	Stock ID	Identifying Marks			Total # Rel./Rcwy	FPP	Returns					Marking Purpose
			Type	Code	Number			1-Oc	2-Oc	3-Oc	Total	Percent	
Hatchery: McCall Cabin/Wrm Lk Cr.		Brood Year: 1993											
07/21/94	11	SFSR	LV Clip		50,163	51,163	115.3						NPT
07/21/94	1	SFSR	LV/PIT		1,000		69.3						
Buckhorn Creek													
07/22/94	11	SFSR	LV Clip		35,259	36,259	107.4						NPT
07/22/94	1	SFSR	LV PIT		1,000		69.3						
08/12/94	11	SFSR	LV Clip		8,740	8,740	86						
Knox Bridge/SFSR													
10/03/94	11 & 14	SFSR	LV clip		139,172	140,172	39.4						NPT
10/03/94			LV/PIT		1,000		39.4						NPT
			LV clip		233,334								
			LV/PIT		3,000								
			Total				236,334 ^d						

^a 1 fish recovered by NPT on spawning grounds below SFSR weir^b 2 fish recovered by NPT on spawning grounds below SFSR weir^c 1 fish incorrectly measured^d BY 1993 releases incomplete

Appendix A. Table 2. Release and return data for Dworshak National Fish Hatchery spring chinook salmon brood years 1989-1992.

Release Site/Date	Rcwy No.	Stock ID	Identifying Marks			Total #		Returns					Marking Purpose
			Type	Code	Number	Rel./Rcwy	FPP	1-Oc	2-Oc	3-Oc	Total	Percent	
Hatchery: Dworshak													
Brood Year: 1989													
N.F. Clrwtr													
4/3-4/91	Unk.		None		404,571		20.6						General Production
04/04/91	1	CLRWTR	CWT/Ad	052431	15,683		18.4	0	6	3	9	0.0574	Density Exp.-Low
"	2		CWT/Ad	052432	15,710		18.4	0	10	2	12	0.0764	"
"	3		CWT/Ad	052433	15,587		21.3	0	3	0	3	0.0192	"
"	4		CWT/Ad	052434	15,881		18.6	0	3	1	4	0.0252	"
"	5		CWT/Ad	052435	16,720		20.9	0	8	2	10	0.0598	"
"	6		CWT/Ad	052436	16,669		21.3	0	6	0	6	0.0360	"
"	7		CWT/Ad	052437	16,715		21.4	0	10	0	10	0.0598	"
"	8		CWT/Ad	052438	16,611		20.3	0	5	0	5	0.0301	"
"	9		CWT/Ad	052439	15,842		19.8	0	4	0	4	0.0252	"
"	Unk.		PIT		1,500			0	0	0	0	0.0000	"
			Low CWT/Ad		145,418		CWT Total	0	55	8	63	0.0433	
N.F. Clrwtr													
04/04/91	10	CLRWTR	CWT/Ad	052440	33,553		20.7	0	9	0	9	0.0268	Density Exp. - Med
"	11		CWT/Ad	052441	33,145		21.5	0	5	0	5	0.0151	"
"	12		CWT/Ad	052442	32,742		22.5	0	11	3	14	0.0428	"
"	13		CWT/Ad	052443	31,527		21.0	0	9	0	9	0.0285	"
"	14		CWT/Ad	052444	33,010		22.5	0	8	0	8	0.0242	"
"	15		CWT/Ad	052445	32,903		19.7	1	10	0	11	0.0334	"
"	Unk.		PIT		1,500			0					"
			Med CWT/Ad		196,880		CWT Total	1	52	3	56	0.0284	
N.F. Clrwtr													
04/04/91	26	CLRWTR	CWT/Ad	052446	46,402		22.7	0	11	2	13	0.0280	Density Exp. - High
"	27		CWT/Ad	052447	47,668		22.4	1	17	2	20	0.0420	"
"	28		CWT/Ad	103025	52,664		23.5	1	10	1	12	0.0228	"
"	Unk.		PIT		1,500			0					"
			High CWT/Ad		146,734		CWT Total	2	38	5	45	0.0307	
Hatchery: Dworshak													
Brood Year: 1989													
N.F. Clrwtr													
04/04/91	16	CLRWTR	CWT/Ad	052508	38,836		21.7	0	7	1	8	0.0206	Low BKD
"	17		CWT/Ad	052509	37,471		22.6	0	6	2	8	0.0213	"
"	18		CWT/Ad	052510	38,244		22.5	0	3	0	3	0.0078	"
"	Unk.		PIT		2,250			0					"
			Low CWT/Ad		114,551		CWT Total	0	16	3	19	0.0166	

Appendix A. Table 2. (Continued)

Appendix A: Table 2: (Continued)													
Release Site/Date	Rcwy No.	Stock ID	Identifying Marks			Total #		Returns					Marking Purpose
			Type	Code	Number	Rel./Rcwy	FPP	1-Oc	2-Oc	3-Oc	Total	Percent	
<u>N.F. Clrwtr</u>													
04/04/91	19	CLRWTR	CWT/Ad	052512	23,832		18.6	0	2	0	2	0.0084	High BKD
"	20		CWT/Ad	052513	23,193		17.5	0	4	0	4	0.0172	"
"	21		CWT/Ad	052511	28,455		18.5	0	0	1	1	0.0035	"
"	Unk.		PIT		4,500			0					"
"			High CWT/Ad		75,480		CWT Total	0	6	1	7	0.0093	
<u>N.F. Clrwtr</u>													
"	Unk.		PIT		1,021		ND						NMFS High Temp + Photo (Tank 8)
"	Unk.		PIT		1,040		ND						NMFS Delayed Release (Tank4)
"	Unk.		PIT		1,011		ND						Zero Age-TC (Tank 1)
			Total CWT/Ad(all)		679,063		CWT Total	3	167	20	190	0.0280	
			Zero Age/PIT		3,072								
			Smolt PIT		11,250								
			None		404,571								
			Total		1,097,956								
<u>Red River</u>													
03/25/91	Unk.	CLRWTR	None		63,004		21.6						General Production
<u>Eldorado Cr.</u>													
3/25-26/91	Unk.	CLRWTR	None		199,456		21.4						General Production
<u>Papoose Cr.</u>													
3/25-26/91	Unk.	CLRWTR	None		70,000		21.8						General Production
			Total Release		1,430,416								
Hatchery: Dworshak													
Brood Year 1990													
<u>N.F. Clrwtr</u>													
04/16/92	Unk.	CLRWTR	None		526,675		NA						General Production
"			CWT/Ad	052647	14,895		14.7	0	0		0	0.0000	Density Exp. - Low
"			CWT/Ad	052648	15,571		15.0	0	1		1	0.0064	"
"			CWT/Ad	052649	15,879		15.3	0	0		0	0.0000	"
"			CWT/Ad	052650	14,558		14.7	0	0		0	0.0000	"
"			CWT/Ad	052651	16,555		14.3	0	1		1	0.0060	"
"			CWT/Ad	052652	15,661		14.8	0	0		0	0.0000	"
"			CWT/Ad	052553	16,181		15.1	0	0		0	0.0000	"
"			CWT/Ad	052654	15,734		14.3	0	0		0	0.0000	"
"			CWT/Ad	052655	16,403		14.6	0	0		0	0.0000	"
			Low CWT/Ad		141,437		CWT Total	0	2		2	0.0014	

Appendix A. Table 2. (Continued)

Release Site/Date	Rcwy No.	Stock ID	Identifying Marks			Total # Rel./Rcwy	FPP	Returns					Marking Purpose
			Type	Code	Number			1-Oc	2-Oc	3-Oc	Total	Percent	
<u>N.F. Clrwtr</u>													
04/16/92	Unk.	CLRWTR	CWT/Ad	052640	29,238		15.1	0	1		1	0.0034	Density Exp. - Medium
"			CWT/Ad	052641	28,153		14.4	0	0		0	0.0000	"
"			CWT/Ad	052642	25,309		14.7	0	0		0	0.0000	"
"			CWT/Ad	052643	31,284		16.2	1	0		1	0.0032	"
"			CWT/Ad	052644	27,984		15.4	0	0		0	0.0000	"
"			CWT/Ad	052645	27,625		14.5	1	3		4	0.0145	"
			Med CWT/Ad		169,593		CWT Total	2	4		6	0.0035	
<u>N.F. Clrwtr</u>													
04/16/92	Unk.	CLRWTR	CWT/Ad	052637	36,179		16.1	0	0		0	0.0000	Density Exp. - High
"			CWT/Ad	052638	42,519		17.3	0	1		1	0.0024	"
"			CWT/Ad	052639	42,966		16.4	0	0		0	0.0000	"
"			High CWT/Ad		121,664		CWT Total	0	1		1	0.0008	
"			Total CWT/Ad (all den.)		432,694		CWT Total (all den.)	2	7		9	0.0021	
"			None		526,675								
"			Total		959,369								
Hatchery: Dworshak													
<u>Red River</u>													
04/07/92	Unk.	CLRWTR	RV		149,605		18.6						Origin Rec./Acc.Spr.Rel.-DNFH Stk
			CWT/Ad	052632	57,795			0	0		0	0.0000	Eval./Acc.Spr.Rel.-DNFH Stock
			Total		207,400								
<u>Powell</u>													
04/08/92	Unk.	CLRWTR	RV		89,924		19.9	0	1 ^a		1	0.0011	Origin Recognition/Acc.Spr.Rel. (3/16/92) - DNFH Stock
			CWT/Ad	052633	60,930		19.9	0	0		0	0.0000	Acc.Spr.Rel.(3/16/92)-DNFH Stock
			RV		2,949		18.7	0	0		0	0.0000	Direct Spr.Rel. (White Sands Cr.)
			CWT/Ad	052635	60,580			0	1		1	0.0017	Eval./Dir.Spr.Rel.(White Sands Cr.)
			Total CWT/Ad		121,510		CWT Total	0	1		1	0.0008	
			Total RV		92,873								
			Total		214,383								
<u>Eldorado Cr.</u>													
03/18/92	Unk.	CLRWTR	None		127,075		21.2						General Production
			CWT/Ad	052634	55,925			0	0		0	0.0000	Evaluation
			Total Release (DNFH)		1,564,152								
<u>Papoose Cr.</u>													
03/17/92	Unk.	CLRWTR	None		8,602		21.0						General Production (from KNFH)
			CWT/Ad	052206	64,171			0	8 ^b		8	0.0125	Evaluation (from KNFH)

Ad clip 17,166

Appendix A. Table 2. (Continued)

Appendix A: Table 2: (Continued)													
Release Site/Date	Rcwy No.	Stock ID	Identifying Marks			Total #		Returns					Marking Purpose
			Type	Code	Number	Rel./Rcwy	FPP	1-Oc	2-Oc	3-Oc	Total	Percent	
N.F. Clwtr (continued)													
04/14/94	23,24	DWOR	CWT/Ad	053159	57,452	187,928	17.9						21 Day Gallimycin
			Ad clip		130,476								
	25,26	DWOR	CWT/Ad	053205	59,281	189,061	18.2						21 Day Gallimycin
			Ad clip		129,780								
	29,30	DWOR	CWT/Ad	053218	60,008	187,352	19.1						21 Day Gallimycin
			Ad clip		127,344								
	26,28	DWOR	CWT/Ad	053219	58,974	187,756	19.1						21 Day Gallimycin
			Ad clip		128,782								
04/22/94	1,2,3	DWOR	CWT/Ad/RAU1	053156	22,664	69,642	15.7						Serial Rel., 21 Day Aquamycin
			CWT/Ad/RAU2	053156	18,226								
			CWT/Ad/RAU3	053156	18,976								
			CWT/Ad	053156	6,148								
			Ad clip		3,628								
04/22/94	4,5,6	DWOR	CWT/Ad/FB	053157	61,840	84,654	16.3						Serial Rel., 21 Day Aquamycin
			Ad/FB		15,937								
			(RDU1)		(22,315) ^c								
			(RDU2)		(30,663) ^c								
			(RDU3)		(24,799) ^c								
			Ad clip		6,877								
Hatchery: Dworshak Brood Year: 1992													
05/06/94	7,8,9	DWOR	CWT/Ad/RDT1	053158	19,630	74,500	14.2						Serial Rel., 21 Day Aquamycin
			CWT/Ad/RDT2		21,377								
			CWT/Ad/RDT3		20,405								
			CWT/Ad	053158	6,799								
			Ad clip		6,289								
			Total CWT/Ad		472,608	1,278,273	CWT Total						
			CWT/Ad/FB		183,118								
			Ad/FB		15,937								
			Ad clip		606,610								
			Total Released		1,278,273								

^a This return could have belonged to this RV group or to the RV group below (Evaluation/Direct Spring Release).

^b One fish trapped @DNFH or KNFH, seven @ Powell Satellite

^c Parentheses indicate that fish were counted (included) in the AD/CWT/FB category or the AD/FB category. The exact breakdown, by freeze brand and coded-wire tag, is unknown.

Appendix A. Table 3. Release and return data for Clearwater Anadromous Fish Hatchery (and satellite facilities) spring chinook salmon brood years 1989-1992.

Release Site/Date	Rcwy No.	Stock ID	Identifying Marks			Total # Rel./Rcwy	FPP	Returns					Marking Purpose
			Type	Code	Number			1-Oc	2-Oc	3-Oc	Total	Percent	
Hatchery: Clearwater		Brood Year: 1992											
Papoose Cr													
04/15/94	1A, 2A	Powell	LV clip		15,610	16,110							Supplementation, Low BKD
			LV/PIT		500								
White Sands Cr													
8/4-5/93	7A	Powell	LV clip		78,985	79,987							Supplementation Studies
			LV/PIT		1,002								
Big Flat Cr													
8/5-6/93	7B	Powell	LV clip		39,875	40,875							Supplementation Studies
			LV/PIT		1,000								
Squaw Cr													
8/5-6/93	7B	Powell	LV clip		11,000	12,000							Supplementation Studies
			LV/PIT		1,000								
Pete King Cr													
8/5-6/93	7B	Powell	LV clip		11,000	12,000							Supplementation Studies
			LV/PIT		1,000								
Lower Meadow Cr													
07/22/93	8A	Rapid R.	CWT/AD	103526	57,812	59,600							Nez Perce Tribe
			AD clip	103526	1,788								
Upper Meadow Cr													
07/20/93	8B	Rapid R.	CWT/AD	103525	52,477	54,100							Nez Perce Tribe
			AD clip		1,623								
			Total			274,672							
Hatchery: Clearwater, Satellite: Red River													
Brood Year: 1989													
Red River													
3/25-27/91		DN/KNFH	None		124,071		24.5						Spring rel. from Kooskia
3/25/91		DN/KNFH	None		63,004		21.6						Spring rel. from Dworshak

Appendix A. Table 3. (Continued.)

Release Site/Date	Rcwy No.	Stock ID	Identifying Marks			Total #		Returns					Marking Purpose
			Type	Code	Number	Rel./Rcwy	FPP	1-Oc	2-Oc	3-Oc	Total	Percent	
Red River (Continued.)													
10/23/90		DN/KNFH	None		169,255		27.9						General Production
		Red R.	None		41,246								
	N Pond	Red R.	CWT/Ad	104304	20,675			0	1	1	2	0.0097	Evaluation and Contribution
		Red R.	CWT/Ad	104305	21,276			0	2	0	2	0.0094	
		Red R.	CWT/Ad	104306	20,548			0	2	0	2	0.0097	
		Red R.	PIT		800								Migration Surv and Timing
			Total CWT/Ad		62,499	CWT Total		0	5	1	6	0.0096	
			PIT		800	No Tags		0	0	0	0		
			Total (Spring)		187,075	Ad CWT tot		0	5	1	6	0.0096	
			None (Fall)		210,501								
			Total		460,075								
Brood Year: 1990													
Red River													
10/23/91		CLRWTR	LV		354,013		31.3	0	1			0.0000	Origin Recognition / LSRCP
			LV/PIT		700			0	0			0.0000	Migration Surv and Timing
04/07/92			RV		149,605		18.6	0	0			0.0000	Origin Recog / Acc.Spr.Rel. (3/16/92) - DNFH Stock
			CWT/Ad	052632	57,795			0	0		0	0.0000	Origin Recog / Acc.Spr.Rel. (3/16/92) - DNFH Stock
			Total		562,113								
Brood Year: 1991													
Red River													
10/19/92	Pond 1	Red River	LV		5,100		15.8	0			0	0.0000	Idaho Supplemental Studies
10/19/92	Pond 1	Red River	LV/PIT		900		15.8	0			0	0.0000	Idaho Supplemental Studies
			Total		6,000								
Brood Year: 1992													
Red River													
10/12/93	Pond	Red River	RV clip		7,271	7,971							High BKD
			RV/PIT		700								
			RV clip		13,975	14,275							Low BKD
			RV/PIT		300								
			Total RV clip		21,246								
			Total RV/PIT		1,000								
			Total RV clip		22,246								

Appendix A. Table 3. (Continued.)

Release Site/Date	Rcwy No.	Stock ID	Identifying Marks			Total #		Returns					Marking Purpose
			Type	Code	Number	Rel./Rcwy	FPP	1-Oc	2-Oc	3-Oc	Total	Percent	
Hatchery: Clearwater, Satellite: Powell													
Brood Year: 1989													
Powell													
3/11-22/91		CLRWTR	None		180,764		23.6						Spring rel from Kooskia
10/23/90			None		243,758		24.7						General Production
	PW Pond		CWT/Ad	104301	20,970			0	2	0	2	0.0095	Evaluation and Contribution
			CWT/Ad	104302	21,547			0	1	1	2	0.0093	
			CWT/Ad	104303	19,830			0	0	0	0	0.0000	
			PIT		800			0	0	0	0	0.0000	Migration Surv and Timing
			Total CWT/Ad(Fall)		62,347		CWT Total	0	3	1	4	0.0064	
			Total (Spring)		180,764		No Tags	0	0	3	3		
			None (Fall)		243,758		Ad CWT total	0	3	4	7	0.0112	
			PIT tags		800								
			Total		487,669								
Brood Year: 1990													
Powell/Wh Sands Cr.													
10/24/91		CLRWTR	None		1,946		30.6						General Production
			CWT/Ad	102942	9,927			0	0		0	0.0000	Evaluation and Contribution
			CWT/Ad	104002	53,008			0	0		0	0.0000	
			LV		292,791			0	0		0	0.0000	
			LV/PIT		700			0	0			0.0000	Migration Surv and Timing
04/08/92			RV		89,924		19.9	0	1 ^a		1	0.0011	Origin Recog / Acc.Spr.Rel. (3/16/92) - DNFH Stock
			CWT/Ad	052633	60,930			0	0		0	0.0000	Acc. Sp. Rel (3/16/92) DNFH Stk
04/08/92			RV		2,949		18.7	0	0		0	0.0000	Direct Spr. Rel (White Sands Cr.)
			CWT/Ad	052635	60,580			0	1		1	0.0017	Evl./Dir Spr.Rel (White Sands Cr)
			Total CWT/Ad		184,445		CWT Total	0	2		2	0.0011	
			RV		92,873		No Tags	0	3		3		
			LV		292,791			0	5		5	0.0027	
			LV/PIT		700		Ad CWT total						
			None		1,948								
			Total		572,757								
Walton Cr.													
09/05/92		Powell	LV		500		23	1			1	0.2000	Supplementation Studies

Appendix A. Table 3. (Continued.)

Release Site/Date	Rcwy No.	Stock ID	Identifying Marks			Total #		Returns					Marking Purpose
			Type	Code	Number	Rel./Rcwy	FPP	1-Oc	2-Oc	3-Oc	Total	Percent	
Hatchery: Clearwater, Satellite: Powell													
Brood Year: 1991													
Crooked Fork Cr. 09/05/92	Pond 1	Powell	LV LV/PIT		7,704 48		23	1			1	0.0130	Supplementation Studies
Brood Year: 1992													
Powell Ponds 0.14811784	1B	Powell	CWT/AD CWT/AD/PIT AD clip	104654 104654	29,323 250 966	30,539							Natural Rearing & Non Acc. Natural Rearing & Non Acc.
	2B		CWT/AD CWT/AD/PIT AD clip Total CWT/AD Total CWT/AD/PIT Total AD clip Total	104655 104655	29,214 250 1,048 58,537 500 2,014 61,051	30,512							Std. Rearing & Non Acc.
Walton Cr 0.361702128	3A	Powell	CWT/AD CWT/AD/PIT AD Clip	104656 104656	32,229 250 3,271	35,750							Std. Rearing & Acclimated
	4A		CWT/AD CWT/AD/PIT AD clip	104657 104657	31,625 250 5,558	37,433							
	5A		CWT/AD CWT/AD/PIT AD Clip	104658 104658	30,996 250 3,252	34,498							Natural Rearing & Acc
	6A		CWT/AD CWT/AD/PIT AD clip	104659 104659	31,384 250 5,508	37,142							

Appendix A. Table 3. (Continued.)

Release Site/Date	Rcwy No.	Stock ID	Identifying Marks			Total #		Returns					Marking Purpose
			Type	Code	Number	Rel./Rcwy	FPP	1-Oc	2-Oc	3-Oc	Total	Percent	
Hatchery: Clearwater, Satellite: Powell Brood Year: 1992													
Walton Cr. Br.													
04/14/94	9A	Powell	AD clip		55,245	55,745							High BKD, Non Acclimated
			AD/PIT		500								
			Total CWT/AD		126,234								
			Total CWT/AD/PIT		1,000								
			Total AD clip		72,834								
			AD/PIT		500								
			Total		200,568								

^a This return could have belonged to this RV group or the RV group below (Evaluation/Direct Spring Release).

Appendix A. Table 4. Release and return data for Sawtooth Fish Hatchery and East Fork Salmon River satellite spring chinook salmon brood years 1989-1992.

Release Site/Date	Rcwy No.	Stock ID	Identifying Marks			Total # Rel./Rcwy	FPP	Returns					Marking Purpose
			Type	Code	Number			1-Oc	2-Oc	3-Oc	Total	Percent	
Hatchery: Sawtooth Salmon R. @ Saw FH			Brood Year: 1989										
3/8-13/91			None		119,193		24.5						High BKD Progeny
	5		PIT		2,231			0	0	0	0	0.0000	USFWS BKD Study-High
	3		PIT		1,798			0	0	0	0	0.0000	USFWS BKD Study-Low
			Subtotal BKD			123,222							
3/8-13/91	4		None		73,426		31.5						Density Exp. - High
3/8-13/91			CWT/Ad	103416	21,662			0	2	0	2	0.0092	"
			CWT/Ad	103417	21,772			1	0	0	1	0.0046	"
3/8-13/91	4&11		PIT		800			0	0	0	0		"
3/8-13/91	4&11		CWT/Ad	103418	20,710		31.5	0	0	0	0	0.0000	"
3/8-13/91	11		CWT/Ad	103428	21,179		28.7	0	1	0	1	0.0047	"
			CWT/Ad	103429	22,448			0	1	0	1	0.0045	"
			CWT/Ad	103430	22,103			0	0	0	0	0.0000	"
			PIT		800			0	0	0	0	0.0000	"
			High CWT/Ad		129,874		CWT Total	1	4	0	5	0.0038	
			Subtotal High			204,900							
Salmon R. @ Saw FH													
3/8-13/91	10		None		17,419	66,695	24.8						Density Exp. - Med.
			CWT/Ad	103425	22,100			0	1	0	1	0.0045	"
			CWT/Ad	103426	14,779			0	0	0	0	0.0000	"
			CWT/Ad	103427	11,597			0	0	0	0	0.0000	"
			PIT		800								
3/8-13/91	6		CWT/Ad	103419	21,276	53,897	24.4	0	2	0	2	0.0094	"
			CWT/Ad	103420	21,235			0	0	0	0	0.0000	"
			CWT/Ad	103421	10,586			0	0	0	0	0.0000	"
			PIT		800								
3/8-13/91	9		CWT/Ad	103422	17,062	59,808	26.0	0	1	0	1	0.0059	"
			CWT/Ad	103423	22,018			0	0	0	0	0.0000	"
			CWT/Ad	103424	19,928			1	2	0	3	0.0151	"
			PIT		800		26.0	0	0	0	0	0.0000	"
			Med. CWT/Ad		160,581		CWT Total	1	6	0	7	0.0044	
			Subtotal Med			180,400							

Appendix A. Table 4. (Continued.)

Release Site/Date	Rcwy No.	Stock ID	Identifying Marks			Total # Rel./Rcwy	FPP	Returns					Marking Purpose
			Type	Code	Number			1-Oc	2-Oc	3-Oc	Total	Percent	
Hatchery: Sawtooth													
Salmon R. @ Saw FH													
3/8-13/91	?	7	None		52,116	52,116	22.3						Density Exp. - Low
			CWT/Ad	104130	14,908	29,650		0	0	0	0	0.0000	"
			CWT/Ad	104131	13,942			0	0	0	0	0.0000	"
3/8-13/91	12		PIT		800								
			CWT/Ad	104211	14,311	30,104	25.5	0	2	0	2	0.0140	"
			CWT/Ad	104212	14,993			0	1	0	1	0.0067	"
3/8-13/91	8		PIT		800								
			CWT/Ad	104217	11,908	30,208	21.8	0	0	0	0	0.0000	"
			CWT/Ad	104218	17,500			0	1	0	1	0.0057	"
			PIT		800		21.8	0	1	0	1	0.1250	"
			Low CWT/Ad		87,562		CWT Total	0	5	0	5	0.0057	
			Subtotal Low		142,078								
			Total CWT/Ad		378,017		CWT Total	2	15	0	17	0.0045	
			None		262,154		No Tags			6 ^a	6 ^b	0.0016	
			Total PIT		10,429		Adj. CWT Total	2	15	6	23	0.0061	
			Total release		650,600								
Hatchery: Sawtooth													
Salmon R. @ Saw FH													
Brood Year: 1990													
3/9-13/92	3A	Salmon R.	None		2,748	34,213	23.5						Density Exp. - Low
			CWT/Ad	104154	14,351			1	0		1	0.0070	
			CWT/Ad	104155	13,803			1	0		1	0.0072	
3/9-13/92	6A	Salmon R.	CWT/Ad/PIT	104155	794			0	0		0	0.0000	
			Ad clip		2,517			0	0		0	0.0000	
			CWT/Ad	104156	14,779	32,182	25.7	0	2		2	0.0135	Density Exp. - Low
			CWT/Ad/PIT	104156	793			0	0		0	0.0000	
			CWT/Ad	104157	15,990			0	0				
3/9-13/92	9A	Salmon R.	Ad clip		620						0	0.0000	
			CWT/Ad	104158	15,498	32,936	26.8	1	0		1	0.0065	Density Exp. - Low
			CWT/Ad/PIT	104158	796			0	0				
			CWT/Ad	104159	16,312						0	0.0000	
			Ad clip		330						0	0.0000	
			CWT/Ad		90,733		CWT Total	3	2		5	0.0055	
			CWT/Ad/PIT		2,383								
			Ad clip		3,467								
			None		2,748								

Subtotal Low 99,331

Appendix A. Table 4. (Continued.)

Appendix A: Table 4: (Continued.)													
Release	Rcwy	Stock	Identifying Marks			Total #	Returns						Marking
Site/Date	No.	ID	Type	Code	Number	Rel./Rcwy	FPP	1-Oc	2-Oc	3-Oc	Total	Percent	Purpose
						y							
Salmon R. @ Saw FH													
3/9-13/92	4A	Salmon R.	None		15,651	70,837	32.0						Density Exp. - Med.
			CWT/Ad	104003	53,360			1	1		2	0.0037	"
			CWT/Ad/PIT	104003	795			0	0		0	0.0000	"
			Ad clip		1,031								"
3/9-13/92	7A	Salmon R.	None		10,071	63,341	29.9						Density Exp. - Med.
			CWT/Ad	104004	51,943			0	0		0	0.0000	"
			CWT/Ad/PIT	104004	794			0	0		0	0.0000	"
			Ad clip		533								"
3/9-13/92	10A	Salmon R.	None		10,741	64,494	29.3						Density Exp. - Med.
			CWT/Ad	104005	51,642			1	1		2	0.0039	"
			CWT/Ad/PIT	104005	794			0	0		0	0.0000	"
			Ad clip		1,317								"
			CWT/Ad		156,945	CWT Total		2	2		4	0.0020	
			CWT/Ad/PIT		2,383								
			Ad clip		2,881								
			None		36,463								
			Subtotal Med		198,672								
Hatchery: Sawtooth													
Salmon R. @ Saw FH													
3/9-13/92	5A	Salmon R.	None		50,545	103,488	35.9						Density Exp. - High
			CWT/Ad	104009	51,206			0	0		0	0.0000	"
			CWT/Ad/PIT	104009	800			0	0		0	0.0000	"
			Ad clip		937			0	0		0	0.0000	"
3/9-13/92	8A	Salmon R.	None		48,999	102,114	36.2						Density Exp. - High
			CWT/Ad	104010	49,731			0	1		1	0.0020	
			CWT/Ad/PIT	104010	835			0	0		0	0.0000	
			Ad clip		2,549			0	0		0	0.0000	
3/9-13/92	11A	Salmon R.	None		51,353	103,914	34.8						Density Exp. - High
			CWT/Ad	104011	48,902			0	0		0	0.0000	
			CWT/Ad/PIT	104011	795			0	0		0	0.0000	
			Ad clip		2,864			0	0		0	0.0000	
			CWT/Ad		149,839	CWT Total		0	1		1	0.0007	
			CWT/Ad/PIT		2,430								
			Ad clip		6,350								
			None		150,897								

Subtotal High 309,516
Subtotal L,M,H 607,519

Appendix A. Table 4. (Continued.)

Release Site/Date	Rcwy No.	Stock ID	Identifying Marks			Total # Rel./Rcwy	FPP	Returns					Marking Purpose
			Type	Code	Number			1-Oc	2-Oc	3-Oc	Total	Percent	
Hatchery: Sawtooth			Brood Year: 1990										
Salmon R.													
03/09/92	12A	Salmon R.	LV		31,491	31,985	44.0						H Recognition
09/20/91			LV/PIT		494								Fall rel. evaluation
03/09/92	13A	Salmon R.	LV		63,094	63,588	44.0						H Recognition
09/20/91			LV/PIT		494								Fall rel. evaluation
03/09/92	14A	Salmon R.	LV		56,587	57,085	44.0						H Recognition
09/20/91			LV/PIT		498								Fall rel. evaluation
03/09/92	1B	Salmon R.	LV		52,316	52,316							High BKD segregation
"	2B	Salmon R.	LV		43,605	43,605							H recognition
"	3B	Salmon R.	LV		66,053	66,053							"
"	4B	Salmon R.	LV		62,275	62,275							"
"	6B	Salmon R.	LV		58,091	58,091							"
"	8B	Salmon R.	LV		49,438	49,458							"
"	5B	Salmon R.	LV		33,839	54,283	30.8						High BKD segregation
			LV/LA-T-3		20,444								"/FPC
03/09/92	7B	Salmon R.	LV		38,046	58,578							High BKD segregation
			LV/LA-T-2		20,532								"/FPC
03/09/92	9B	Salmon R.	LV		38,853	59,048							High BKD segregation
			LV/LA-T-1		20,195								"/FPC
			Total CWT/Ad		397,517		CWT Total	20	30		50	0.0124	(Includes PIT-tagged fish)
			Total CWT/Ad/PIT		7,196		No Tags	13			13		
			Total Ad clip		12,698		Adj. CWT Total	20	43		63	0.0156	(Includes PIT-tagged fish)
			Total LV		593,688		All LV	15	25		40	0.0061	(Includes PIT & FB fish)
			Total LV/PIT		1,486								
			Total LV/FB		61,171								
			Total None		190,108								
			Total Release		1,263,864								
Y.F. Salmon R.													
06/18/91	Dir Rel	RAPR	None		50,480		202.0						Fingerling Rel (Rapid R Stk)
9/26-27/91	10B-14B	RAPR	RV		303,800	303,800	68.0						Fall Rel Eval. (Rapid R. Stk)

Appendix A. Table 4. (Continued.)

Release Site/Date	Rcwy No.	Stock ID	Identifying Marks			Total # Rel./Rcwy	FPP	Returns					Marking Purpose
			Type	Code	Number			1-Oc	2-Oc	3-Oc	Total	Percent	
Hatchery: Sawtooth													
Upper Salmon R.													
04/20/93	4	Salmon R.	RV		51,019	51,819	25.0						Supplementation
04/20/93			RV/PIT		800		25.0						
10/2-7/92	5	Salmon R.	CWT/RV	104313	21,820	32,804	20.0	0			0	0.0000	Supplementation/Low Dens
			CWT/RV	104943	10,000		21.0	0			0	0.0000	
			RV/Ad		184								
			RV/Ad/PIT		800		20.0						
		Subtotal Low CWT/RV			31,820								
10/2-7/93	8	Salmon R.	CWT/RV	105001	22,559	60,345	27.0	0			0	0.0000	Supplementation/Med Dens
			CWT/RV	105002	20,387			0			0	0.0000	
			CWT/RV	105003	15,588			0			0	0.0000	
			RV/Ad		1,011						0	0.0000	
			RV/Ad/PIT		800			0			0	0.0000	
		Subtotal Med CWT/RV			58,534								
10/2-7/93	11	Salmon R.	CWT/RV	104912	101,743	104,890	34.0	0			0	0.0000	Supplementation/High Dens
			RV/Ad		2,347								
			RV/Ad/PIT		800								
		Subtotal High CWT/RV			101,743								
		Total CWT/RV			192,097		CWT Total	0	0		0	0.0000	
			RV		51,019								
			RV/Ad		3,542								
			RV/Ad/PIT		2,400								
			RV/PIT		800								
		Total			249,858								
Salmon R. @ Saw FH													
4/5-8/93	2	Salmon R.	CWT/Ad	105033	23,533	67,126	26.0	0			0	0.0000	BKD
			CWT/Ad	105035	21,498			0			0	0.0000	
			CWT/Ad	105036	20,081			0			0	0.0000	
			Ad clip		2,014						0	0.0000	
4/5-8/93	3	Salmon R.	CWT/Ad	105031	20,598	42,627	24.0	0			0	0.0000	BKD

CWT/Ad	105032	20,750	0	0	0.0000
Ad clip		1,279		0	0.0000
Subtotal BKD CWT/Ad		106,460			

Appendix A. Table 4. (Continued.)

Appendix A: Table 4. (Continued.)													
Release	Rcwy	Stock	Identifying Marks			Total #	Returns						Marking
Site/Date	No.	ID	Type	Code	Number	Rel./Rcwy	FPP	1-Oc	2-Oc	3-Oc	Total	Percent	Purpose
						y							
Hatchery: Sawtooth													
Salmon R. @ Saw FH													
10/2-8/92	6	Salmon R.	CWT/Ad	104219	15,464	32,168	28.0	0			0	0.0000	Low Density
			CWT/Ad	104220	15,739			0			0	0.0000	
10/2-8/92			Ad clip		164		28.0						
			Ad/PIT		801			0			0	0.0000	
10/2-8/92	7	Salmon R.	CWT/Ad	105023	14,970	32,820	26.0	0			0	0.0000	Low Density
			CWT/Ad	105024	16,865			0			0	0.0000	
			Ad clip		185								
					800			0			0	0.0000	
		Subtotal LOW CWT/Ad			63,038								
10/2-8/92	9	Salmon R.	CWT/Ad	105028	21,661	65,981	30.0	0			0	0.0000	Medium Density
			CWT/Ad	105029	20,949			0			0	0.0000	
			CWT/Ad	105030	21,579			0			0	0.0000	
			Ad clip		993								
10/2-8/92	10	Salmon R.	Ad/PIT		799			0			0	0.0000	Medium Density
			CWT/Ad	105025	15,096	55,183	29.0	0			0	0.0000	
			CWT/Ad	105026	21,308			0			0	0.0000	
			CWT/Ad	105027	16,936			0			0	0.0000	
			Ad clip		1,043								
			Ad/PIT		800			0			0	0.0000	
		Subtotal Med CWT/Ad			117,529								
10/2-8/92	12	Salmon R.	CWT/Ad	104311	14,081	127,589	33.0	0			0	0.0000	High Density
			CWT/Ad	104913	109,684			0			0	0.0000	
			Ad clip		3,024								
			Ad/PIT		800			0			0	0.0000	

Appendix A. Table 4. (Continued.)

Appendix A: Table 4. (Continued.)													
Release	Rcwy	Stock	Identifying Marks			Total #	Returns						Marking
Site/Date	No.	ID	Type	Code	Number	Rel./Rcwy	FPP	1-Oc	2-Oc	3-Oc	Total	Percent	Purpose
						y							
Hatchery: Sawtooth		Brood Year: 1991											
10/2-8/92	13	Salmon R.	CWT/Ad	104914	98,190	101,227	36.0	1			1	0.0010	High Density
			Ad clip		2,237							0.0000	
			Ad/PIT		800			0			0	0.0000	
			Subtotal High CWT/Ad		221,955			1			1	0.0005	
			Total CWT/Ad		508,982		CWT Total	1			1	0.0002	(Could be Ad only fish)
							No Tags	2			2	0.0004	
			Total CWT/RV		192,097		Adj. CWT Total	3			3	0.0006	
			Ad clip		10,775		Unmarked	3					
			Ad/PIT		4,800								
			RV		51,019								
			RV/Ad		3,706								
			RV/Ad/PIT		2,400								
			RV/PIT		800								
			Total Release		774,579								
			Low CWT All		94,858	Includes CWT/ad & CWT RV							
			Med CWT All		176,063	"							
			High CWT All		323,698	"							
Hatchery: Sawtooth		Brood Year 1992											
Upper Salmon R.													
04/09/94	5	Salmon R.	LV		22,074	22,337	22.0						Supplementation
			LV/PIT		263								
04/09/94	6	Salmon R.	LV		32,284	32,584	25.0						Supplementation
			LV/PIT		300								
04/09/94	7	Salmon R.	LV		17,379	17,379	28.0						Supplementation
			Total LV		71,737								
			Total LV/PIT		563								
			Subtotal USR		72,300								
Sal R. @ Sawtooth													
04/13/94	1	Salmon R.	Ad clip		21,524	21,864	25.0						High BKD group
			Ad/PIT		340								

Subtotal BKD 21,864

4/9-13/94	8	Salmon R.	CWT/Ad	104927	21,036	23,388	24.0	Natural Rearing Control 1
			Ad clip		1,995			
			CWT/Ad/PIT	104927	357			

Appendix A. Table 4. (Continued.)

Release Site/Date	Rcwy No.	Stock ID	Identifying Marks			Total # Rel./Rcwy	FPP	Returns					Marking Purpose
			Type	Code	Number			1-Oc	2-Oc	3-Oc	Total	Percent	
4/9-13/94	11	Salmon R.	CWT/Ad Ad clip	104929	20,234 3,159	23,750	24.0						Natural Rearing Control 2
4/9-13/94	12	Salmon R.	CWT/Ad/PIT CWT/Ad Ad clip CWT/Ad/PIT NR Contr CWT/Ad NR Contr Ad clip NR Contr CWT/Ad/PIT NR Control all	104929 104604 104612	357 11,110 5,404 1,369 249 57,784 6,523 963 65,270	18,132	19.0						Natural Rearing Control 3
Hatchery: Sawtooth		Brood Year: 1992											
4/9-13/94	10	Salmon R.	CWT/Ad Ad clip	104928	18,312 2,698	21,336	24.0						Natural Rearing, Test 1
4/9-13/94	13	Salmon R.	CWT/Ad/PIT CWT/Ad Ad clip CWT/Ad/PIT	104928 104930 104930	326 23,540 379 378	24,297	25.0						Natural Rearing, Test 2
Sawtooth Hatchery													
4/9-13/94	14	Salmon R.	CWT/Ad CWT/Ad Ad clip CWT/Ad/PIT NR Test CWT/Ad NR Test CWT/Ad/PIT NR Test Ad Clip NR Test CWT all Total Release	104605 104611	5,903 2,519 94 325 50,274 1,029 3,171 51,303 213,908	8,841	29.0						Natural Rearing, Test 3
			CWT/Ad Ad clip		108,058 31,218								

CWT/Ad/PIT	1,992
Ad/PIT	340
Sub total @SFH	141,608
Sub total SFH	213,908
EFSR	12,368
Total Release	226,276

Appendix A. Table 4. (Continued.)

Release Site/Date	Rcwy No.	Stock ID	Identifying Marks			Total # Rel./Rcwy	FPP	Returns					Marking Purpose
			Type	Code	Number			1-Oc	2-Oc	3-Oc	Total	Percent	
Hatchery: Sawtooth, Satellite: East Fork Salmon River													
Brood Year 1989													
E.F. Salmon R.													
3/5/91		E.F.S.R.	NONE		98,300		30.7	15	19	13	1128	1.1475	
Brood Year 1990													
E.F. Salmon R.													
3/30-31/92	1A	E.F.S.R.	CWT/Ad	104006	46,804	57,559		0	0		0	0.0000	Evaluation/Contribution
			Ad clip		2,288			0	0		0	0.0000	"
			CWT/Ad	104213	8,072			0	0		0	0.0000	"
			Ad clip		395			0	0		0	0.0000	"
3/30-31/92	2A	E.F.S.R.	CWT/Ad	104006	3,795	19,055		0	0		0	0.0000	Evaluation/Contribution
			Ad clip		185			0	0		0	0.0000	"
			CWT/Ad	104310	7,113			0	0		0	0.0000	"
			Ad clip		348			0	0		0	0.0000	"
			CWT/Ad	104313	7,260			0	0		0	0.0000	"
			Ad clip		354			0	0		0	0.0000	"
			Total CWT/Ad		73,044	CWT Total		0	0		0	0.0000	
			Total Ad		3,570	No Tags							
			Total Release		76,614	Ad CWT Total		0	0		0	0.0000	
Brood Year 1991													
E.F. Salmon R.													
04/20/93	1	Salmon R.	LV		34,822	35,172	22.7	0			0	0.0000	Supplementation
		Salmon R.	LV/PIT		350		22.7	0			0	0.0000	
			Total Release		35,172								
Brood Year 1992													
EF.S.R @ Boundary Cr													
04/08/94	3	EFSR	RV		11,996	12,368	22.0						Supplementation
			RV/PIT		372								

Total Release	12,368
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^a If all 6 No tags came from High D, then $11/129874=0.00874$

^b If 2 each from L, M, H, then $H=7/129,874=0.00539$; $M=9/160,581=0.0056$; $L=7/87,562=0.00799$

Appendix A. Table 5. Release and return data for Kooskia National Fish Hatchery spring chinook salmon brood year 1992.

Release Site/Date	Rcwy No.	Stock ID	Identifying Marks			Total #		Returns					Marking Purpose
			Type	Code	Number	Rel./Rcwy	FPP	1-Oc	2-Oc	3-Oc	Total	Percent	
Hatchery: Kooskia NFH			Brood Year: 1992										
<u>Clear Cr.</u> 04/18/94	11,12	KNFH	CWT/Ad Ad clip	052636	56,102 4,170	60,272	20.2						Erythro Inad, 3 Feedings
<u>Clear Cr.</u> 04/18/94	9,10	KNFH	CWT/Ad Ad clip	053160	57,384 2,141	59,525	20.2						Erythro Inad, 3 Feedings
<u>Clear Cr.</u> 04/18/94	7,8	KNFH	CWT/Ad Ad clip	053161	65,603 1,091	66,694	20.2						Erythro Inad, 3 Feedings
<u>Clear Cr.</u> 04/18/94	5,6	KNFH	CWT/Ad Ad clip	053162	53,979 5,711	59,690	20.2						Erythro Inad, 3 Feedings
<u>Clear Cr.</u> 04/18/94	3,4	KNFH	CWT/Ad Ad clip	053163	50,975 8,657	59,632	20.2						
			Total CWT/Ad		284,043								
			Total Ad clip		21,770								
			Total		305,813								

Appendix A. Table 6. Release and return data for Rapid River Fish Hatchery spring chinook salmon, brood years 1989-1992.

Release Site/Date	Rcwy No.	Stock ID	Identifying Marks			Total #		Returns					Marking Purpose
			Type	Code	Number	Rel./Rcwy	FPP	1-Oc	2-Oc	3-Oc	Total	Percent	
Hatchery: Rapid River			Brood Year: 1989										
<u>Rapid River</u>													
3/15-4/5/91	1B	RAPR	CWT/Ad	103401	19,500	318,711	24.1	1	0	0	1	0.0051	U.S. Can/Contribution
			CWT/Ad	103402	19,359			1	0	0	1	0.0052	
			CWT/Ad	103403	19,198			0	0	0	0	0.0000	
			CWT/Ad	103404	19,537			0	0	0	0	0.0000	
			CWT/Ad	103405	20,438			0	0	3	3	0.0147	
			CWT/Ad	103406	19,704			1	0	0	1	0.0051	
			CWT/Ad	103407	18,763			2	0	0	2	0.0107	U.S. Can Cont./Water Budget
			CWT/Ad	103408	19,141			0	2	2	4	0.0209	U.S. Can/Contribution
			CWT/Ad	103409	19,856			0	1	2	3	0.0151	
			CWT/Ad	103410	19,556			2	0	1	3	0.0153	
			CWT/Ad	103411	20,026			0	0	0	0	0.0000	
			CWT/Ad	103412	19,757			0	1	0	1	0.0051	
			CWT/Ad	103413	19,600			0	0	1	1	0.0051	
			CWT/Ad	103414	20,525			0	0	1	1	0.0049	U.S. Can Cont./Water Budget
			CWT/Ad	103415	19,878			0	0	1	1	0.0050	
			Ad clip		23,873								(CWT fish which shed tags)
			CWT		294,838		CWT Total	7	4	11	22	0.0075	
			Ad Clip		23,873		No Tags	ND	ND	ND	ND		
			Total		318,711		Ad CWT total	7	4	11	22	0.0075	
Hatchery: Rapid River			Brood Year: 1990										
<u>Rapid River</u>													
3/16-31/92	1A	RAPR	CWT/Ad	103501	66,905	194,094	20.3	0	3		3	0.0045	U.S. Can/Contribution
			CWT/Ad	103502	66,741			0	2		2	0.0030	
			CWT/Ad	103503	60,448			0	0		0	0.0000	
3/16-31/92	2A	RAPR	CWT/Ad	103504	65,906	65,906	20.3	0	0		0	0.0000	U.S. Can/Contribution
	2AB	RAPR	CWT/Ad	103505	51,981	51,981		0	0		0	0.0000	
			Ad clip		6,001	6,001							(CWT fish which shed tags)
			CWT		311,981		CWT Total	0	5		5	0.0016	
			Total		317,982		No Tags						
							Ad CWT total	0	5	0	5	0.0016	

Appendix A. Table 6. (Continued.)

Release Site/Date	Rcwy No.	Stock ID	Identifying Marks			Total #		Returns					Marking Purpose	
			Type	Code	Number	Rel./Rcwy	FPP	1-Oc	2-Oc	3-Oc	Total	Percent		
Hatchery: Rapid River			Brood Year: 1991											
<u>Rapid River</u>														
4/14-19/93	1A	RAPR	CWT/LV	104906	110,086	560,898	22.6	0			0	0.0000	Contrib, Mag. Off/Clip eval	
			CWT/LV	104907	110,382			0			0	0.0000	"	
			CWT/LV	104921	53,129			0			0	0.0000	"	
			CWT/LV/PIT	104921	812			0			0	0.0000	Clip eval/migration surv	
			CWT/Ad	104917	215,026			0			0	0.0000	Cont' clip eval	
			CWT/Ad	104920	54,586			0			0	0.0000	"	
			CWT/Ad/PIT	104920	50			0			0	0.0000	Clip eval migr surv.	
			LV/Ad		8,487								(CWT fish which shed tags)	
			Ad clip		8,340								"	
4/14-19/93	1B	RAPR	CWT/LV	104910	111,730	575,097	23.9	0			0	0.0000	Contr. Mag off/Clip eval	
			CWT/LV	104911	112,017			0			0	0.0000	"	
			CWT/LV	104923	56,008			0			0	0.0000	"	
			CWT/LV/PIT	104923	762			0			0	0.0000	Clip eval/migr. surv	
			CWT/Ad	104908	113,462			0			0	0.0000	"	
			CWT/Ad	104909	108,975			1			1	0.0009	"	
			CWT/Ad	104922	54,840			0			0	0.0000	"	
			CWT/Ad/PIT	104922	50			0			0	0.0000	"	
			LV/Ad		8,625								(CWT fish which shed tags)	
			LV/PIT		51								"	
			Ad clip		8,577								"	
4/14-19/93	2A	RAPR	CWT/LV	104901	311,650	661,301	26.8	0			0	0.0000	Evaluation, Mag. Off	
04/17/93			CWT/LV/PIT	104901	50			0			0	0.0000		
4/14-19/93			CWT/Ad	103601	333,592			0			0	0.0000	U.S. Canada, Mag. On	
04/17/93			CWT/Ad/PIT	103601	50			0			0	0.0000	"	
4/14-19/93			LV/Ad		5,640						0	0.0000	(CWT fish which shed tags)	
			Ad clip		10,319						0	0.0000	"	
4/16-19/93	2D	RAPR	CWT/Ad	Blank	251,234	259,004	26.8	1			1	0.0004	ID., Mag. off	
			Ad clip		7,770			0			0	0.0000	(CWT fish which shed tags)	
Hatchery: Rapid River			Brood Year: 1991											
			CWT/LV		865,002		CWT Total	2			2	0.0002		
			CWT/LV/PIT		1,624		No Tags							
			CWT/Ad		1,131,715		Ad CWT total	2			2	0.0002		
			CWT/Ad/PIT		150									
			LV/Ad		26,752									
			LV/PIT		51									
			Ad clip		35,006									
			Total		2,060,300									

Appendix A. Table 6. (Continued.)

Appendix A: Table C: (Continued.)													
Release Site/Date	Rcwy No.	Stock ID	Identifying Marks			Total # Rel./Rcwy	FPP	Returns					Marking Purpose
			Type	Code	Number			1-Oc	2-Oc	3-Oc	Total	Percent	
<u>Hells Canyon Dam</u>													
04/16/93	2D	RAPR	CWT/Ad	Blank	194,191		26.8	0			0	0.0000	ID., Mag. off
			CWT/Ad/PIT	Blank	100			0			0	0.0000	
			Ad clip		6,009						0	0.0000	(CWT fish which shed tags)
			Total		200,300								
<u>Squaw Cr.</u>													
07/23/92	5	RAPR	RV		10,126								H/W Recognition
<u>White Sands Cr.</u>													
07/23/92	5	RAPR	RV		90,125								H/W Recognition
Hatchery: Rapid River Brood Year: 1992													
<u>Rapid River</u>													
4/8-12/94	1A	RAPR	CWT/AD	104903	46,583	552,066	20.85						U.S. Canada
4/8-12/94			Ad clip		504,042		20.85						Hatchery/Wild Recognition
4/11-12/94			CWT/Ad/PIT or Ad/PIT		1,441		20.39						FPC/Migration/surv timing
4/8-12/94	1B	RAPR	CWT/AD	104903	48,473	565,215	18.86						U.S. Canada
			Ad clip		515,305								Hatchery/Wild Recognition
			CWT/Ad/PIT or Ad/PIT		1,437								FPC/Migration/surv timing
4/8-25/94	2A	RAPR	CWT/AD	104903	97,843	444,863	19.77						U.S. Canada
			Ad clip		3,026								U.S. Canada
			Ad clip		343,994								Hatchery/Wild Recognition
4/8-25/94	2B	RAPR	CWT/AD	104903	113,406	453,085	21.64						U.S. Canada
			Ad clip		3,507								U.S. Canada
			Ad clip	104923	336,172								Hatchery/Wild Recognition
4/8-25/94	2C	RAPR	Ad clip		451,813	451,813	21.85						U.S. Canada
			Ad/PIT										FPC/Migration/surv timing
4/21-25/94	2D	RAPR	Ad clip		80,600	461,104	17.97						Hatchery/Wild Recognition
			CWT/Ad		306,305		CWT Total						
			Ad clip		2,238,459		No Tags						
			Ad PIT or CWT/Ad/PIT		2,878		Ad CWT total						
			Total		2,547,642								
<u>Hells Canyon Dam</u>													
4/20-21/94	2D	RAPR	Ad clip		380,262	461,104	20.54						Hatchery/Wild Recognition
			Ad/PIT		242		20.39						FPC/Migration/surv timing

Appendix A. Table 7. Release and return data for Pahsimeroi Fish Hatchery summer chinook salmon Brood Year 1991-1992

Release Site/Date	Rcwy No.	Stock ID	Identifying Marks			Total #		Returns					Marking Purpose
			Type	Code	Number	Rel./Rcwy	FPP	1-Oc	2-Oc	3-Oc	Total	Percent	
Hatchery: Pahsimeroi			Brood Year: 1991										
Pahsimeroi R.													
4/14-19/93	P 1	PAH SU	CWT/Ad	104931	20,432	12.6				1			SFH Reared
			CWT/Ad	104932	20,340								SFH Reared
			CWT/Ad	104933	21,339								PAH Reared
			CWT/Ad	104934	21,414								PAH Reared
			Ad clip		65,356								SFH/PAH Reared
4/14-19/93	P 2	PAH SU	CWT/Ad	104935	20,655	13.7							PAH Reared
			CWT/Ad	104936	21,494								PAH Reared
			CWT/Ad	104939	9,899								SFH Reared
			CWT/Ad	104940	9,684								SFH Reared
			CWT/Ad	104941	10,506								PAH Reared
			CWT/Ad	104942	9,148								PAH Reared
			Ad clip		60,780								SFH/PAH Reared
4/14-19/93	P1/P2	PAH SU	LV clip		83,953	13.1							PAH Reared
			Total CWT		164,911		Total CWT	0	1				
			Total Ad clip		126,136		Total No tags		50				
			Total LV		83,953		Total LV		11				
			Total		375,000		Total Unmarked		11				
Hatchery: Pahsimeroi			Brood Year: 1992										
Pahsimeroi R.													
4/8-12/94	P 1	PAH SU	Ad clip		40,641	63,294							H/W Recognition
			LV		22,653								Supplementation studies
			Ad/PIT or LV/PIT		(499)								
Pahsimeroi R.													
4/8-12/94	P 2	PAH SU	Ad clip		40,805	63,496							H/W Recognition
			LV		22,691								Supplementation studies
			Ad/PIT or LV/PIT		(499)								Migration Surv./timing
Pahsimeroi R.													
4/8-12/94	1	PAH SU	Ad clip		2,591	3,720							Positive female BKD, H/W Reg
			LV		1,129								Supplementation Studies
			Ad/PIT or LV/PIT		(499)								Migration Surv./Timing
			Total Ad clip		84,037		Total AD	2					
			Total LV		46,473		Total LV	1					
			Total Ad/PIT or LV/PIT		(998)		Total Unmarked	4					
			Total		130,510								

Appendix B. Table 1. Returns of coded-wire-tagged adult chinook salmon to McCall Fish Hatchery in 1994. Total number of marked fish recovered = 224 (213 Ad, 10 RV, one Unk); seven Ad clipped fish also recovered by NPT. All returns were to the South Fork Salmon River weir unless otherwise noted.

Brood Year '89 5-yr olds								
	<650		650-820		>820			
Tag code	M	F	M	F	M	F	Total	
103431	0	0	0	1	2	6	9	(Includes 1 female: 865mm NPT)
103432	0	0	0	0	3	5	8	
103433	0	0	0	1	4	3	8	
103434	0	0	0	1	2	5	8	
103435	0	0	0	0	4	13	17	(Includes 2 females: 918mm, 880mm NPT)
103436	0	0	0	0	3	5	8	(Includes 1 female: 880 mm NPT)
103437	0	0	0	1	3	9	13	(Includes 1 female: assumed >820mm)
103438	0	0	1	0	1	3	5	
103439	0	0	0	1	4	8	13	
103440	0	0	2	1	5	7	15	(Includes 1 female: 1020 NPT)
103441	0	0	0	0	2	7	9	(Includes 1 female: 990 NPT)
103442	0	0	0	1	2	5	8	
103443	0	0	0	1	4	5	10	
103444	0	0	0	0	4	5	9	(1 prob. mistake: rec. as 440mm; incl. 1 fem.: 835mm NPT)
103445	0	0	0	0	1	7	8	
Total CWT	0	0	3	8	44	93	148	(NPT recs = 7-all female)
No Tag	0	0	0	0	3	3	6	
Total	0	0	3	8	47	96	154	

Brood Year '90 4-yr olds								
	<650		650-820		>820			
Tag code	M	F	M	F	M	F	Total	
103448	0	0	1	0	0	0	1	
103449	0	0	1	0	0	0	1	
103457	0	0	2	0	1	0	3	
103459	0	0	0	0	0	1	1	
Total CWT	0	0	4	0	1	1	6	
No Tag	0	0	1	0	0	0	1	
Total	0	0	5	0	1	1	7	

Brood Year '91 3-yr olds								
	<650		650-820		>820			
Tag code	M	F	M	F	M	F	Total	
103225	4	0	0	0	0	0	4	
103226	7	0	0	0	0	0	7	
103227	4	0	0	0	0	0	4	
103602	28	0	0	0	0	0	28	(includes 1 w/no length-assumed<640)
Total CWT	43	0	0	0	0	0	43	
Ad clipped	16	0	0	0	0	0	16	
RV clipped	10	0	0	0	0	0	10	
Total	69	0	0	0	0	0	69	

Appendix B. Table 2. Returns of coded-wire-tagged adult chinook salmon to Dworshak National Fish Hatchery in 1994. All returns were to the hatchery unless otherwise noted.

<u>BY '89 5-yr olds</u>							
<u>Tag code</u>	<u><650</u>		<u>650-820</u>		<u>>820</u>		<u>Total</u>
	<u>M</u>	<u>F</u>	<u>M</u>	<u>F</u>	<u>M</u>	<u>F</u>	
052431							3
052432							2
053434							1
052435							2
052442							3
052446							2
052447							2
052508							1
052509							2
052511							1
103025							1
Total CWT							20
No Tag							0
Total							20
<u>BY '90 4-yr olds</u>							
<u>Tag code</u>	<u><650</u>		<u>650-820</u>		<u>>820</u>		<u>Total</u>
	<u>M</u>	<u>F</u>	<u>M</u>	<u>F</u>	<u>M</u>	<u>F</u>	
052206							7
052635							1
052638							1
052640							1
052645							3
052648							1
052651							1
Total CWT							15
No Tag							0
RV clipped							1
Total							16
<u>Brood Year '91 3-yr olds</u>							
No Returns							

Appendix B. Table 3. Returns of coded-wire-tagged adult chinook salmon to Clearwater Anadromous Fish Hatchery satellite facilities in 1994. All returns were to hatchery weirs unless otherwise noted.

Red River

2 marked fish recovered: 1 Ad, 1 LV

Brood Year '89 5-yr olds

	<640		640-820		>820		
Tag code	M	F	M	F	M	F	Total
104304	0	0	0	0	1	0	1

Held @ Red R. 14 d., presmolt release

Brood Year '90 4-yr olds

	<640		640-820		>820		
	M	F	M	F	M	F	Total
None	0	0	0	1	0	0	1

Brood Year '91 3-yr olds

	<640		640-820		>820		
	M	F	M	F	M	F	Total
LV	0	0	0	0	0	0	0

Crooked River

6 marked fish recovered: 1 Ad, 5 LV

Brood Year '89 5-yr olds

	<640		640-820		>820		
Tag code	M	F	M	F	M	F	Total
104309	0	0	0	0	1	0	1

Brood Year '90 4-yr olds

	<640		640-820		>820		
	M	F	M	F	M	F	Total
LV	0	0	2	3	0	0	5

Powell

17 marked fish recovered: 15 Ad, 1 Ad/RV, 1 LV

Brood Year '89 5-yr olds

	<640		640-820		>820		
Tag code	M	F	M	F	M	F	Total
104302	0	0	0	0	1	0	1
Ad clipped	0	0	0	0	0	3	3
Total	0	0	0	0	1	3	4

Powell release

Brood Year '90 4-yr olds

	<640		640-820		>820		
Tag code	M	F	M	F	M	F	Total
052206	0	0	2	5	0	0	7
052635	0	0	0	1	0	0	1
Total CWT	0	0	2	6	0	0	8
Ad clipped	0	0	1	2	0	0	3
Ad/RV	0	0	1	0	0	0	1
Total	0	0	4	8	0	0	12

Rel. from Kooskia NFH @ mouth of Papoose Cr.
Non-acc. rel. from DNFH to White Sands Cr.

Brood Year '91 3-yr olds

	<640		640-820		>820		
	M	F	M	F	M	F	Total
LV	1	0	0	0	0	0	1

Appendix B. Table 4. Returns of coded-wire-tagged adult chinook salmon to Sawtooth Fish Hatchery in 1994. Fifty-two marked fish were trapped, and 14 snouts examined (7 Ad, 6 LV, 1 Unmk). All returns were to the hatchery weir unless otherwise noted.

<u>Brood Year '89 5-yr-olds</u>							
	<650		650-820		>820		
<u>Tag code</u>	<u>M</u>	<u>F</u>	<u>M</u>	<u>F</u>	<u>M</u>	<u>F</u>	<u>Total</u>
N/A	0	0	0	0	0	0	0
Ad clipped	0	0	0	0	4	2	6
Released fish; no snouts submitted from fish >820							
<u>Brood Year '90 4-yr olds</u>							
	<640		640-820		>820		
<u>Tag code</u>	<u>M</u>	<u>F</u>	<u>M</u>	<u>F</u>	<u>M</u>	<u>F</u>	<u>Total</u>
104003	0	0	1	0	0	0	1
104005	0	0	1	0	0	0	1
104010	0	0	1	0	0	0	1
104156	0	0	2	0	0	0	2
Total CWT	0	0	5	0	0	0	5
No Tag	0	0	0	1	0	0	1
Ad clipped	0	0	8	4	0	0	12
LV clipped	0	0	10	14	1	0	25
Total	0	0	23	19	1	0	43
Medium Density Medium Density High Density Low Density							
<u>Brood Year '91 3-yr olds</u>							
	<640		640-820		>820		
<u>Tag code</u>	<u>M</u>	<u>F</u>	<u>M</u>	<u>F</u>	<u>M</u>	<u>F</u>	<u>Total</u>
104914	1	0	0	0	0	0	1
Ad clipped	2	0	0	0	0	0	2
Total	3	0	0	0	0	0	3
Snouts not submitted							

No marked fish returned to the East Fork Salmon River weir

Appendix B. Table 5. Returns of coded-wire-tagged adult chinook salmon to Rapid River Fish Hatchery in 1994. Twenty-four marked fish were recovered, all were adipose-clipped. All fish returned to the hatchery weir unless otherwise noted.

Brood Year '89 5-yr-olds							
	<650		650-820		>820		
Tag code	M	F	M	F	M	F	Total
103405	0	0	0	1	2	0	3
103408	0	0	0	0	1	1	2
103409	0	0	1	1	0	0	2
103410	0	0	0	0	1	0	1
103413	0	0	0	0	1	0	1
103414	0	0	0	0	1	0	1
103415	0	0	0	0	1	0	1
Total CWT	0	0	1	2	7	1	11
Ad clipped	0	0	0	0	2	1	3
Total	0	0	1	2	9	2	14

Brood Year '90 4-yr-olds							
	<640		640-820		>820		
Tag code	M	F	M	F	M	F	Total
103501	0	0	1	2	0	0	3
103502	0	0	0	2	0	0	2
Total CWT	0	0	1	4	0	0	5
Ad clipped	0	0	0	1	0	1	2
Total	0	0	1	5	0	1	7

Brood Year '91 3-yr-olds							
	<640		640-820		>820		
Tag code	M	F	M	F	M	F	Total
104909	1	0	0	0	0	0	1
Blank Wire	1	0	0	0	0	0	1
Total CWT	2	0	0	0	0	0	2
Ad clipped	2	0	0	0	0	0	2
Total	4	0	0	0	0	0	4

Appendix C. Interrogations of PIT-tagged juvenile chinook salmon released from Idaho hatcheries and emigrating in spring 1994.

File Name	Rel. Site	Rel. Date	No. Tag	No. Rel.	No./% Detected										Ave. Travel Time (days) ^a	Median Travel Time (days) ^b
					LGR		LGO		LMN		MCN		TOTAL			
					No.	%	No.	%	No.	%	No.	%	No.	%		
McCall Fish Hatchery		<i>SUMMER CHINOOK</i>														
<i>Supplementation Studies:</i>																
DAC94070.SPM	KNOXB	4/09	498	498	84	16.9	36	7.2	18	3.6	40	8.0	178	35.7	31.0	32
<i>Time of Release Study:</i>																
DAC94069.T1T	KNOXB	4/12	400	400	73	18.3	34	8.5	21	5.3	28	7.0	156	39.0	31.3	29
DAC94070.T1C	KNOXB	4/14	400	400	53	13.3	36	9.0	14	3.5	31	7.8	134	33.5	30.2	29
DAC94070.T2T	KNOXB	4/22	400	400	38	9.5	26	6.5	13	3.3	23	5.8	100	25.0	28.3	27
DAC94070.T2C	KNOXB	4/28	400	400	46	11.5	30	7.5	17	4.3	12	3.0	105	26.3	29.2	23
Rapid River Fish Hatchery		<i>SPRING CHINOOK</i>														
DAC94067.HEL	HCD	4/20-21	250	250	40	16.0	11	4.4	11	4.4	13	5.2	75	30.0	18.8	20
LRB94066.RRH	RAPH	4/12	1501	1498	362	24.2	73	4.9	63	4.2	57	3.8	555	37.0	21.6	21
LRB94067.RRA	RAPH	4/21	1500	1498	283	18.9	67	4.5	58	3.9	56	3.7	464	31.0	17.5	18
Pahsimeroi Fish Hatchery		<i>SUMMER CHINOOK</i>														
DAC93274.PP1	PAHP	4/9-14	499	499	82	16.4	10	2.0	8	1.6	18	3.6	118	23.6	19.6	19
DAC93274.PP2	PAHP	4/9-14	499	499	61	12.2	9	1.8	11	2.2	25	5.0	106	21.2	17.1	22
Sawtooth Fish Hatchery		<i>SPRING CHINOOK</i>														
<i>Natural Rearing Experiment - Treatment:</i>																
DAC93272.S10	SAWT	4/8-9	501	326	23	7.1	6	1.8	10	3.1	5	1.5	44	13.5	24.7	26*
DAC93271.S13	SAWT	4/8-9	496	374	40	10.7	4	1.1	10	2.7	12	3.2	66	17.6	25.9	26*
DAC93272.S14	SAWT	4/8-9	500	155	13	8.4	4	2.6	3	1.9	3	1.9	23	14.8	25.3	26*
Treatment Total			1497	855	* Median Travel Time data was pooled from all three groups of fish									133	15.6	
<i>Natural Rearing Experiment - Control:</i>																
DAC93272.S08	SAWT	4/11	500	357	35	9.8	1	0.3	6	1.7	13	3.6	55	15.4	20.7	25*
DAC93272.S11	SAWT	4/8-9	500	357	31	8.7	7	2.0	6	1.7	6	1.7	50	14.0	25.3	25*
DAC93272.S12	SAWT	4/8-9	499	248	23	9.3	3	1.2	7	2.8	6	2.4	39	15.7	25.3	25*
Control Total			1499	962	* Median Travel Time data was pooled from all three groups of fish									144	15.0	
<i>Supplementation Studies:</i>																
DAC93273.S05	USR	4/09	500	263	16	6.1	3	1.1	5	1.9	7	2.7	31	11.8	24.2	27*
DAC93272.S06	USR	4/09	499	299	25	8.4	3	1.0	6	2.0	8	2.7	42	14.0	27.5	27*
Supplementation Total			999	562	* Median Travel Time data was pooled from both groups of fish									73	13.0	
<i>High BKD Release:</i>																
DAC93273.S01	SAWT	4/11	499	339	35	10.3	5	1.5	6	1.8	7	2.1	53	15.6	22.5	24
<i>East Fork Release:</i>																
DAC93273.S03	SALREF	4/08	500	372	26	7.0	3	0.8	9	2.4	10	2.7	48	12.9	28.3	27

File Name	Rel. Site	Rel. Date	No. Tag	No. Rel.	No./% Detected										Ave. Travel Time (days) ^a	Median Travel Time (days) ^b
					LGR		LGO		LMN		MCN		TOTAL			
					No.	%	No.	%	No.	%	No.	%	No.	%		
Clearwater Fish Hatchery		<i>SPRING CHINOOK</i>														
<i>Fall Releases:</i>																
DAC93214.WS1	WHITSC	8/04	635	635	15	2.4	6	0.9	5	0.8	4	0.6	30	4.7	291.7	275*
DAC93214.WS2	WHITSC	8/04	367	367	14	3.8	2	0.5	5	1.4	4	1.1	25	6.8	288.9	275*
White Sands Cr. Rel. Total			1002	1002	* Median Travel Time data was pooled from both groups of fish									55	5.5	
DAC93215.BF1	BIGFLC	8/05	575	575	19	3.3	5	0.9	3	0.5	4	0.7	31	5.4	248.5	270*
DAC93215.BF2	BIGFLC	8/05	425	425	13	3.1	3	0.7	5	1.2	4	0.9	25	5.9	268.8	270*
Big Flat Cr. Rel. Total			1000	1000	* Median Travel Time data was pooled from both groups of fish									56	5.6	
DAC93215.SQ1	SQUAWC	8/05	500	500	6	1.2	1	0.2	0	0.0	1	0.2	8	1.6	287.6	279*
DAC93215.SQ2	SQUAWC	8/05	500	500	8	1.6	4	0.8	2	0.4	2	0.4	16	3.2	302.3	279*
Squaw Cr. Rel. Total			1000	1000	* Median Travel Time data was pooled from both groups of fish									24	2.4	
DAC93215.PK1	PETEK C	8/06	474	474	37	7.8	7	1.5	7	1.5	7	1.5	58	12.2	275	273*
DAC93215.PK2	PETEK C	8/06	526	526	25	4.8	2	0.4	7	1.3	10	1.9	44	8.4	262.2	273*
Pete King Cr. Rel. Total			1000	1000	* Median Travel Time data was pooled from both groups of fish									102	10.2	
<i>Spring Releases:</i>																
<u>Acclimation and Natural Rearing Studies:</u>																
<i>Acclimated and Naturally Reared:</i>																
DAC94063.C5A	POWP	4/13	250	250	50	20.0	23	9.2	17	6.8	27	10.8	117	46.8	24.9	27*
DAC94063.C6A	POWP	4/13	250	250	62	24.8	18	7.2	12	4.8	25	10.0	117	46.8	23.6	27*
<i>Acclimated and Control (standard rearing):</i>																
DAC94062.C3A	POWP	4/13	250	250	75	30.0	16	6.4	16	6.4	31	12.4	138	55.2	26	26*
DAC94062.C4A	POWP	4/13	250	250	70	28.0	16	6.4	24	9.6	42	16.8	152	60.8	25	26*
<i>Non-Acclimated and Naturally Reared:</i>																
DAC94063.C1B	POWP	4/13	250	250	64	25.6	17	6.8	13	5.2	32	12.8	126	50.4	21.1	22
<i>Non-Acclimated and Control (standard rearing):</i>																
DAC94063.C2B	POWP	4/13	250	250	70	28.0	19	7.6	18	7.2	23	9.2	130	52.0	20.8	22
<u>High BKD fish (Non-Acclimated):</u>																
DAC94063.C9A	POWP	4/14	500	500	99	19.8	19	3.8	22	4.4	50	10.0	190	38.0	21.1	25
<u>Supplementation Studies (Low BKD fish):</u>																
DAC94063.C1A	PAPOOC	4/15	250	250	68	27.2	15	6.0	12	4.8	17	6.8	112	44.8	21.8	24*
DAC94063.C2A	PAPOOC	4/15	250	250	63	25.2	6	2.4	11	4.4	27	10.8	107	42.8	21.5	24*

File Name	Rel. Site	Rel. Date	No. Tag	No. Rel.	No./% Detected										Ave. Travel Time (days) ^a	Median Travel Time (days) ^b	
					LGR		LGO		LMN		MCN		TOTAL				
					No.	%	No.	%	No.	%	No.	%	No.	%			
<u>Volitional Release</u>																	
RBK94099.CRH	CROTRP	4/9	167	167	45	26.9	9	5.4	20	12.0	14	8.4	88	52.7	19	17.1	
RBK94100.CRH	CROTRP	4/10	143	143	24	16.8	6	4.2	1	0.7	9	6.3	40	28.0	20.9	19.9	
RBK94101.CRH	CROTRP	4/11	100	100	14	14.0	0	0.0	3	3.0	3	3.0	20	20.0	21.9	20.4	
RBK94102.CRH	CROTRP	4/12	100	100	10	10.0	6	6.0	2	2.0	7	7.0	25	25.0	27.6	26.1	
RBK94103.CRH	CROTRP	4/13	100	100	4	4.0	1	1.0	6	6.0	6	6.0	17	17.0	26.3	28.3	
Crooked River Rel. Total			610	610									190	31.1			
<u>Forced Release</u>																	
RBK94105.CRH	CROTRP	4/15	150	150	30	20.0	6	4.0	13	8.7	19	12.7	68	45.3	19.8	20.7	
RBK94106.CRH	CROTRP	4/16	150	150	31	20.7	6	4.0	10	6.7	18	12.0	65	43.3	18.9	19.7	
RBK94108.CRH	CROTRP	4/18	100	100	9	9.0	8	8.0	4	4.0	4	4.0	25	25.0	23.9	21.2	
RBK94109.CRH	CROTRP	4/19	100	100	12	12.0	7	7.0	2	2.0	6	6.0	27	27.0	23.6	21	
Crooked River Rel. Total			500	500									185	37			
<u>Red River Satellite Hatchery</u>			<i>SPRING CHINOOK</i>														
<i>Fall Releases:</i>																	
DAC93279.RR1	REDP	10/12	700	700	20	2.9	12	1.7	7	1.0	5	0.7	44	6.3	224.5	212*	
DAC93279.RR2	REDP	10/12	300	300	10	3.3	8	2.7	4	1.3	2	0.7	24	8.0	207.7	212*	
Red River Rel. Total			1000	1000	* Median Travel Time data was pooled from both groups of fish									68	6.8		
<u>Magic Valley Steelhead Hatchery</u>			<i>SUMMER STEELHEAD</i>														
<i>Pahsimeroi A Stock:</i>																	
DAC94045.M14	HAZARC	4/26	100	100	41	41.0	9	9.0	2	2.0	5	5.0	57	57.0	16.1	N/A	
DAC94045.M16	HAZARC	4/26	100	100	52	52.0	12	12.0	1	1.0	3	3.0	68	68.0	14.6	N/A	
Hazard Cr. Rel. Total			200	200									125	62.5			
DAC94045.M9E	PAHSIW	4/19	150	150	63	42.0	8	5.3	4	2.7	3	2.0	78	52.0	19.9	N/A	
DAC94045.M11	PAHSIW	4/19	151	151	74	49.0	13	8.6	3	2.0	2	1.3	92	60.9	16.4	N/A	
Pahsimeroi Weir Rel. Total			301	301									170	56.5			
<i>Dworshak B Stock:</i>																	
DAC94044.M4E	HAZARC	4/28	100	99	46	46.5	6	6.1	0	0.0	0	0.0	52	52.5	15.1	N/A	
DAC94044.M4W	HAZARC	4/28	100	100	39	39.0	9	9.0	1	1.0	3	3.0	52	52.0	16	N/A	
DAC94044.M7E	HAZARC	4/28	100	100	35	35.0	10	10.0	3	3.0	4	4.0	52	52.0	12.7	N/A	
Hazard Cr. Rel. Total			300	299									156	52.2			
DAC94044.M1E	SALEFW	4/14-15	100	100	30	30.0	6	6.0	3	3.0	0	0.0	39	39.0	24.2	N/A	
DAC94044.M2E	SALEFW	4/14-15	100	100	39	39.0	6	6.0	1	1.0	0	0.0	46	46.0	24.5	N/A	
DAC94044.M3E	SALEFW	4/14-15	100	100	36	36.0	3	3.0	4	4.0	1	1.0	44	44.0	21.6	N/A	
Sal. R. East Fork Weir Rel. Total			300	300									129	43.0			

File Name	Rel. Site	Rel. Date	No. Tag	No. Rel.	No./% Detected										Ave. Travel Time (days) ^a	Median Travel Time (days) ^b
					LGR		LGO		LMN		MCN		TOTAL			
					No.	%	No.	%	No.	%	No.	%	No.	%		
DAC94044.M5E	SLATEC	4/16&18	150	150	53	35.3	8	5.3	3	2.0	0	0.0	64	42.7	22.6	N/A
DAC94044.M6E	SLATEC	4/16&18	150	150	46	30.7	6	4.0	1	0.7	1	0.7	54	36.0	27.1	N/A
Slate Cr. (USR) Rel. Total			300	300									118	39.3		
East Fork B Stock:																
DAC94045.M7W	SALEFW	4/15-16	100	100	41	41.0	8	8.0	1	1.0	0	0.0	50	50.0	25.3	N/A
DAC94045.M8E	SALEFW	4/15-16	100	100	26	26.0	4	4.0	2	2.0	1	1.0	33	33.0	26.1	N/A
DAC94045.M8W	SALEFW	4/15-16	100	100	41	41.0	8	8.0	3	3.0	3	3.0	55	55.0	21.2	N/A
Sal. R. East Fork Weir Rel. Total			300	300									138	46.0		
Hagerman National Fish Hatchery				SUMMER STEELHEAD												
Acclimation Study, Treatment (Acclimated) Groups:																
DAC94047.H54	SAWT	4/25-29	100	100	26	26.0	8	8.0	1	1.0	2	2.0	37	37.0	29.1	N/A
DAC94048.H55	SAWT	4/25-29	98	98	24	24.5	4	4.1	3	3.1	2	2.0	33	33.7	20.3	N/A
DAC94048.H56	SAWT	4/25-29	100	100	19	19.0	7	7.0	1	1.0	2	2.0	29	29.0	13.3	N/A
Acclimated Total			298	298									99	33.2		
Acclimation Study, Control (Non-Acclimated) Groups:																
DAC94047.H51	SAWT	4/29	102	102	30	29.4	10	9.8	3	2.9	1	1.0	44	43.1	14.8	N/A
DAC94047.H52	SAWT	4/29	100	100	30	30.0	9	9.0	5	5.0	1	1.0	45	45.0	15.8	N/A
DAC94047.H53	SAWT	4/29	100	100	24	24.0	3	3.0	5	5.0	5	5.0	37	37.0	15.7	N/A
Control Total			302	302									126	41.7		
DAC94048.H85	HAZARC	4/25	100	100	43	43.0	8	8.0	5	5.0	4	4.0	60	60.0	15.3	N/A
DAC94048.H86	HAZARC	4/25	100	100	42	42.0	11	11.0	7	7.0	1	1.0	61	61.0	17.7	N/A
Hazard Cr. (Warm Spr. Bridge) Rel. Total			200	200									121	60.5		
DAC94048.H74	SALR(Brun)	4/11-12	100	100	54	54.0	4	4.0	3	3.0	2	2.0	63	63.0	22.2	N/A
DAC94048.H75	SALR(Brun)	4/12	100	100	37	37.0	6	6.0	3	3.0	2	2.0	48	48.0	20.6	N/A
DAC94048.H76	SALR(Brun)	4/12	100	100	58	58.0	1	1.0	3	3.0	4	4.0	66	66.0	20.4	N/A
Sal. R. at Bruno Rel. Total			300	300									177	59.0		
DAC94048.H98	LEMHIR	4/4&4/6	200	200	96	48.0	8	4.0	8	4.0	4	2.0	116	58.0	28.3	N/A

File Name	Rel. Site	Rel. Date	No. Tag	No. Rel.	No./% Detected										Ave. Travel Time (days) ^a	Median Travel Time (days) ^b
					LGR		LGO		LMN		MCN		TOTAL			
					No.	%	No.	%	No.	%	No.	%	No.	%		
Niagara Springs Fish Hatchery					<i>SUMMER STEELHEAD</i>											
<i>Pahsimeroi Weir Rel:</i>																
DAC94046.N05	PAHSIW	4/10	316	316	142	44.9	16	5.1	8	2.5	3	0.9	169	53.5	22.8	N/A
<i>Salmon River at McNab point Rel:</i>																
DAC94047.N06	SALR	4/13	200	200	88	44.0	10	5.0	4	2.0	3	1.5	105	52.5	20.1	N/A
<i>Salmon River North Fork Rel:</i>																
DAC94047.N10	SALRNF	4/14-15	200	200	106	53.0	9	4.5	8	4.0	4	2.0	127	63.5	17.7	N/A
<i>Hells Canyon Dam Rel:</i>																
DAC94047.N11	HCD	4/16-17	100	100	32	32.0	4	4.0	1	1.0	0	0.0	37	37.0	17.8	N/A
DAC94047.N12	HCD	4/17	102	102	51	50.0	7	6.9	1	1.0	2	2.0	61	59.8	17.5	N/A
HCD Rel. Total			202	202									98	48.5		
<i>Hells Canyon Rel:</i>																
DAC94043.BB1	HCD	4/25-5/01	200	199	55	27.6	11	5.5	5	2.5	4	2.0	75	37.7	16	N/A
<i>Hammer Cr. (Lower Sal. R.) Rel:</i>																
DAC94046.BB2	SALR	5/2-5/5	150	150	60	40.0	9	6.0	5	3.3	1	0.7	75	50.0	9.0	N/A
DAC94046.BB3	SALR	5/2-5/5	150	150	51	34.0	17	11.3	5	3.3	6	4.0	79	52.7	10.4	N/A
Hammer Cr. Rel. Total			300	300									154	51.3		
Clearwater Fish Hatchery					<i>SUMMER STEELHEAD</i>											
<i>Crooked River Rel:</i>																
DAC93236.MIX	CROOKR	4/29-5/3	468	467	72	15.4	52	11.1	16	3.4	9	1.9	149	31.9	15.2	N/A
<i>Kooskia Rack Rel:</i>																
DAC94075.C3W	KOOS	5/03	300	300	190	63.3	18	6.0	10	3.3	5	1.7	223	74.3	9.4	N/A
<i>Cottonwood Cr. Rel (on South Fork Clearwater R.):</i>																
DAC94075.C4W	CLWRSF	4/25	200	200	115	57.5	14	7.0	7	3.5	2	1.0	138	69.0	9.4	N/A
<i>Stites Rel. Site Rel (on South Fork Clearwater R.):</i>																
DAC93237.C6E	CLWRSF	4/25-26	160	158	72	45.6	9	5.7	2	1.3	1	0.6	84	53.2	10.0	N/A
DAC94075.C6E	CLWRSF	4/25-26	39	39	18	46.2	7	17.9	1	2.6	0	0.0	26	66.7	11.7	N/A
Stites Rel. Total			199	197									110	55.8		
<i>Red House Hole Rel. (on South Fork Clearwater R.):</i>																
DAC93237.C7E	CLWRSF	4/26	156	155	78	50.3	8	5.2	5	3.2	1	0.6	92	59.4	8.3	N/A
DAC94075.C7E	CLWRSF	4/26	44	44	33	75.0	1	2.3	3	6.8	1	2.3	38	86.4	8.9	N/A
Red House Hole Rel. Total			200	199									130	65.3		

^a Based on detections @ LGR only

^b Based on detections @ LGR only

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